



**FIRM FIXED PRICE AND COST PLUS FIXED FEE CONSTRUCTION  
CONTRACTS IN IRAQ AND AFGHANISTAN**

**THESIS**

Lindsay M. Jaskowiak, Captain, USAF  
AFIT/GEM/ENV/12-M10

**DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY**

***AIR FORCE INSTITUTE OF TECHNOLOGY***

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**Wright-Patterson Air Force Base, Ohio**

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THESIS

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Lindsay M. Jaskowiak

Captain, USAF

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Lindsay M. Jaskowiak, BS

Captain, USAF

Approved:

\_\_\_\_\_  
//signed//

Lieutenant Colonel Peter Feng, PhD, P.E. (Chairman)

\_\_\_\_\_  
2 Mar 2012

Date

\_\_\_\_\_  
//signed//

Lieutenant Colonel Paul Cotelleso, PhD

\_\_\_\_\_  
1 Mar 2012

Date

\_\_\_\_\_  
//signed//

Major Vhance Valencia, MS, P.E.

\_\_\_\_\_  
1 Mar 2012

Date



## **Abstract**

Firm Fixed Price and Cost Plus Fixed Fee contract types have been utilized the most for construction in the Iraq and Afghanistan theaters. Often construction occurs in contested regions that are known to be particularly challenging, unpredictable, and unstable. The object of this study was to analyze the performance of these two contract types in this contingency environment, and to determine what internal and external influencing factors seemed to impact contract success the most.

The methodology first evaluated existing construction performance data using bivariate and analysis of variance to identify differences contract type. Next, a quantitative/qualitative questionnaire was conducted to gather expert opinions on the factors that were perceived to have the most impact on contingency contract performance. The combined synthesis of information sources was used to determine what key performance/risk measures impacted success of each contract type the most, and what measures may be beneficial for evaluating contingency construction contract success in the future.

The findings of this study indicated there was no proven advantage in cost performance for either contract type. FFP projects showed to control schedule growth significantly better than CPFF. CPFF contracts indicated a better quality product. Additional results of this study identified that understanding project performance in a contingency environment involved a balance of numerous variables that may impact projects in unique ways based on the chosen contract type.

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Lindsay M. Jaskowiak

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# FIRM FIXED PRICE AND COST PLUS FIXED FEE CONSTRUCTION CONTRACTS IN IRAQ AND AFGHANISTAN

## **Chapter 1: Problem Statement**

### **Introduction**

Construction contracts in Afghanistan and Iraq have been continually plagued with execution problems and poor outcomes (Thibault and others 2009, Thibault and others 2011, Roemhildt 2010, SIGAR 2011, GAO 2011). The operating areas in Afghanistan and Iraq are known to be unpredictable and unstable. Often construction occurs in contested regions. Contractors can face the threat of hostilities such as kidnappings, death threats, political pressure, poor supply lines, and unskilled or unreliable labor. It can be difficult adequately quantify the impact of a single influencing factor when so many forces are bearing down on a construction project that is lagging behind or is suffering from poor workmanship.

In Afghanistan and Iraq construction efforts are complex and problematic. Construction agencies and contractors find it difficult to mitigate risks in an environment with an unskilled labor force, poor supplies, logistical challenges, and security threats thwarting their great efforts to complete projects. In a place with ongoing war and force requirements greater than logistics can supply, turning a project from inception to occupancy is a challenge (Dorko 2011, SIGAR 2011, Thibault and others 2011).

Finding the right contract-type to effectively balance the risk for the government and the contractor in such an unpredictable environment is important (DCMA 2010). An imbalance of risk can influence the long-term viability of the completed construction project, and a good balance can provide the mutual benefits of establishing sustainable personnel and contract relationships (S. G. Arditi 2005). The attainment of feedback on the benefits and risks experienced by both the government and contractors in the execution of different contract types in addition to existing project performance data may assist decision-making in the selection of contract types in future work.

## **Background**

Since the start of the war in 2001, the United States Army Corps of Engineers (USACE) has been executing construction projects in the active war zones of Afghanistan and later, Iraq (Dorko 2011). Since 2004 the Air Force Center for Engineering and the Environment (AFCEE) has executed similar construction projects (Cassidy 2011).

USACE and AFCEE are responsible for the majority of multi-million dollar host-nation reconstruction task orders in Afghanistan and Iraq. These two agents have both executed primarily Cost Plus Fixed Fee (CPFF) or Firm Fixed Price (FFP) contract types, but little has been published evaluating the specific outcomes of construction projects in a combat zone with respect to contract type (Manuel 2010; Thibault and others 2011). This thesis evaluated available data to determine if contract type impacts construction performance, and/or if other factors play a significant role in project success.

Recurring problems seem to continue to plague construction projects in Afghanistan and Iraq. In a January 2011 The Federal Commission Hearing on Wartime Contracting identified issues and the need to improve:

“host-nation involvement in project selection, cost, schedule and quality of the construction projects in Afghanistan, sustainability of the US funded construction projects in Afghanistan, the past performance record of construction companies employed, and quality assurance problems...and finally the adequacy of contractor business systems used to monitor progress of major construction projects” (Thibault and others 2011).

Since so many issues exist in a contingency environment it can be difficult to sift through all the problems to determine which variable(s) can be isolated and influenced by government construction agencies to stabilize and improve performance and which variables may have the greatest positive impact. USACE and AFCEE generally leverage different contract types, organizational structures, requirements generation techniques, security and logistics risk postures, and construction oversight methodologies (SIGAR 2011). So, it may be beneficial to focus on only one organization to come to a clearer conclusion on which factors are having the most impact on construction success.

To evaluate the performance of CPFF and FFP contract types one must determine the influential indicators of performance and success, and evaluate contracts with standardized criterion. Several researchers have studied the impact of key performance indicators on measuring project success (A. A. Chan 2004, A. P. Chan 2002, A. A. Chan 2004, A. P. Chan 2004, S. G. Arditi 2005, Akintoye 1997). This research gathered expert

opinions on the most influential performance indicators for success in literature, those used in practice by our agencies, and quantitative and qualitative performance data,

This research gathers and analyzes expert feedback, quantitative performance data, organizational practices, and study the challenges of combat theater. The outcome of this study may help determine which performance measures may be the most advantageous for USACE and AFCEE to consider in as part of their existing project performance tracking.

## **Problem Statement**

The purpose of this study was to evaluate the current operations of AFCEE and USACE, but focus primarily on construction outcomes against a set of performance criteria to provide more realistic contract feedback to program and project managers. The hope was to produce reliable comparisons and conclusions on the performance successes and failures of FFP and CPFF contracts in an active war zone. Also, the goal was to compile a set of influential contingency performance measures that could be used as a tool to evaluate or consider when choosing the most advantageous contract types for future projects.

## **Research Questions**

The following questions outline the intent of this research:

- 1. How does an agency choose CPFF versus FFP?*
- 2. What risks are associated with CPFF and FFP contracts in Iraq and Afghanistan?*

3. *What measures of performance are used for Iraq and Afghanistan and should others be considered for use?*
4. *Does one contract type produce a better product based on available data and/or determined measures of performance?*
5. *How do those results compare to another market, such as the United States?*

## **Methodology**

The methodology employed in this research is two-fold. The first goal was to measure project performance based on existing construction data, and to determine the possible influences of that performance on overall contract-type success. The second goal was to determine what key performance/risk indicators may be beneficial for evaluating project success in the future.

The first step was to take existing performance data and perform statistical analysis. Available construction data from AFCEE construction projects in Afghanistan, Iraq, and the United States was included to compare and contrast existing performance in multiple environments. Two statistical analysis tools were used to find trends, correlations, and significant differences in the available contract performance data. The expectation was to identify key performance indicators for the environment, their impact on overall project success.

The second goal was to establish key performance indicators (KPIs) that could be used to measure project success. An extensive literature review of performance criteria was executed to discover which performance measures are used to define a successful project in the federal government and also in the civilian sector. Next, expert opinions

from construction personnel with experience in Afghanistan and Iraq were gathered to determine the most appropriate measures for use in the region. The results of the analysis will be discussed in the final chapters.

### **Assumptions and Limitations**

Several assumptions were made in the methodology employed. The first, that all data on construction projects in AFCEE would be available to review and the data entries would be error-free. The second assumption was that statistical performance evaluations would have the power required to indicate some trends between the criteria of project success. Finally, it was assumed that the survey process would receive a high feedback rate from most project participant positions involved in contingency construction.

Limitations of this research may be difficulty transferring project data and performance measures from AFCEE, and also in gathering accurate project data and representative samples of the population in the survey. The risk of pulling inaccurate data entries from active databases or a limited number of available projects for each contract type could skew the statistical significance of results and therefore produce fewer reliable conclusions. Lack of participation in the interview process could make the results of expert feedback less valuable for organizations that may wish to employ their suggestions.

### **Significance of Study**

The outcome of this research will be a quantitative and qualitative analysis of CPFF and FFP contract types in an active combat zone, and a suggested set of military contingency specific performance measures. The resulting analysis outputs and expert

feedback on contingency contract performance may positively influence the way the government performs construction contracts in current operations and future conflicts.

## **Chapter 2: Literature Review**

### **Background**

The United States Government most often awards two different types of contracts: fixed price and cost reimbursement (Manuel 2010). Each type has its own advantages and risks (DCMA 2010). The Contracting Officer bears the responsibility to determine which type is most appropriate based on a number of factors. Prior to solicitation, future work is evaluated against a number of criteria to include: complexity, competition, requirement definition, project length and historical data of similar work (Manuel 2010). The decision to choose cost plus or fixed type contracts in Iraq and Afghanistan has largely been split (J. A. Christoff 2005, Walker 2007). The purpose of this literature study is to better understand the two contract types, their historical use in the government and private sector, what tools are used to indicate project success, and to distill recent audits and guidance released by federal agencies with respect to these two contract types in order to develop the background for contingency contracting analysis.

### **Firm Fixed and Cost Plus Fixed Fee Type Contracts**

A fixed price type contract is the most commonly used contract for federal procurement. It is the default method for all contracting actions; utilized when conditions are fairly certain and risk is minimal (GSA 2010). The maximum amount of responsibility is placed on the contractor to perform within the agreed price and time constraints with the minimum amount of oversight and project control required for the



government. (Mayo 2010, DCMA 2010). The imperative for a successful firm fixed price contract is a well developed requirement and reasonable estimates can be made for the project's execution (GSA 2010).

A cost type contract is most commonly used in federal procurement when uncertainty in scope, duration, and performance are such that it is not reasonable to use a fixed price contract. The award amount and payments are made to reimburse the contractor as costs are incurred. Like fixed price contracts, cost contracts have a price ceiling that cannot be exceeded without permission of the contracting officer. An important aspect of a cost contract is the necessity of more rigorous government oversight (GAO 2011). The contractor must also provide well-documented cost information during project progress (GSA 2010).

A cost plus fixed fee contract is different from the basic cost type contract, in that the contractor is allotted a pre-negotiated fee for his work. This fee is not dependent on the actual contract amount; the contractor is given a small incentive to complete the project on time and within budget. This contract type is designed to, "permit contracting efforts that might otherwise present too great a risk to the contractors" (GSA 2010). This type of contract puts the government at a higher risk, so although there is increased flexibility to make changes, the project must be monitored more carefully by the project manager (Mayo 2010, GAO 2011).

## **Identifying Construction Risk**

Construction contracting in international, contingency environments is considered a high-risk business. Similar projects often have entirely different risk characteristics in

different regions. Accurately identifying and controlling risk factors for each new project is crucial for survival.

Construction project risk falls into two basic categories: environmental or external and project or internal risk. Internal risk internationally is often similar to domestic projects and generally easier to avoid, although the extremity of internal issues is sometimes heightened in a contingency. External project risk is the most difficult to understand and mitigate. Agents and contractors need to consider external risk from many angles: the national, regional, and political lens (Zhi 1995). In Afghanistan and Iraq, external risks initially brought about a steep learning curve for all parties involved (J. A. Christoff 2005, Christoff and others 2006, Hutton 2006, Walker 2007).

In Afghanistan and Iraq a number of lessons learned were highlighted and documented through Government Accountability Office (GAO) reports from 2003 through 2011, and also audits and hearings from Congressional Committees from 2008 through 2011. Problems in Afghanistan include: bribery, contract fraud, faulty construction, unreliable materials, poor site selection, and inability to provide adequate oversight (Thibault and others 2011). In Iraq, attacks on coalition, Iraqi's and contractors developing infrastructure reached such high levels in 2006 that costs for increased security and support were estimated to rise to almost 33 percent of total estimated construction costs (Christoff and others 2006).

Effective risk identification and management has become increasingly important for success. Projects have become increasingly complex and foreign environments remain unstable and difficult navigate without adequate understanding of the risks.

Although construction risk is most often determined based on experience, assumptions and rules of thumb by contractors and owners, this intuitive approach is not necessarily the best way to identify and manage risks in Afghanistan and Iraq (Baloi and Price 2002).

## **Iraq and Afghanistan Construction Background**

The United States Army Corps of Engineers (USACE) and the Air Force Center for Engineering and the Environment (AFCEE) are the two primary organizations tasked to accomplish large-scale construction work for government and infrastructure rebuilding in Iraq and Afghanistan. Each organization works to support the mission of the in-country customer. In Iraq the customer was the Multi-National Coalition-Iraq (MNC-I), and in Afghanistan it is U.S. Forces Afghanistan (USFOR-A) and the Combined Security Transition Command Afghanistan (CSTC-A). The customer develops the basic requirement and then tasks one of the construction agents with execution. The process of further project development, award, and construction then follows the specific structures of the construction agent's organization (Mayo 2010).

### **AFCEE Construction Agency**

AFCEE is a field-operating agency for the Air Force Civil Engineer. It provides environmental and engineering services for Air Force installations. In 2003 the Chairman of the Joint Chiefs of Staff through the Air Force Chief of Staff asked AFCEE to provide assistance with construction efforts in Central Command (CENTCOM). By 2004, the organization started its supporting operation in Iraq. In 2006, AFCEE began providing construction capacity in Afghanistan.

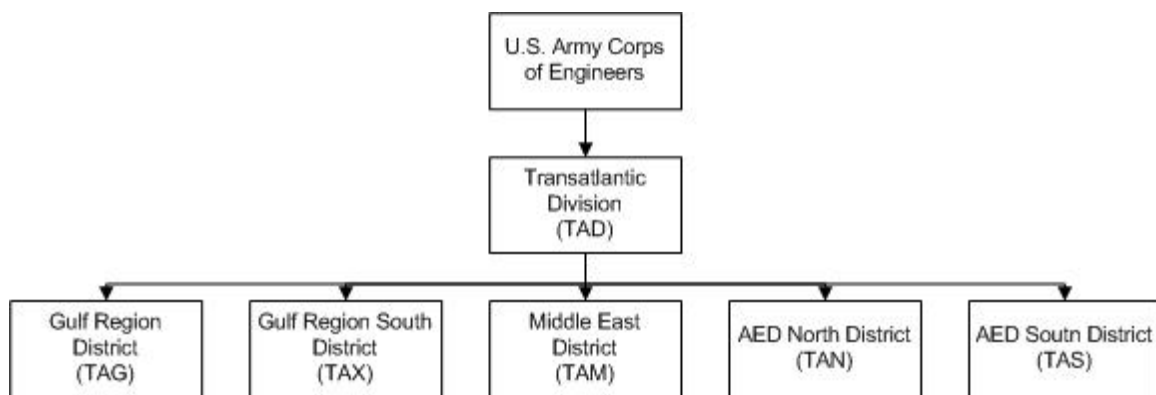
AFCEE utilizes its own Heavy Engineer, Repair and Construction (HERC), and Worldwide Planning, Program and Design (4PAE) contracts to accomplish the majority of their construction requirements. The HERC and 4PAE contracts are Indefinite Delivery, Indefinite Quantity (IDIQ) contract vehicles. These allow AFCEE to hire expatriates prime contractor construction, design, and quality assurance personnel for all of their projects. AFCEE encourages primes to utilize third country national and local national subcontractors to execute task orders. This approach provides AFCEE projects with a minimum of US civilian, military, and contractor footprint and a large force of local workers and laborers. This model allows greater overall flexibility, accessibility by quality assurance personnel, and cost-effectiveness (Cassidy 2011).

The Contingency Construction Division (AFCEE/CX) office in San Antonio, Texas is consists of a relatively small staff and serves as the hub for all of their construction and contract efforts in the Central Command (CENTCOM) Area of Operations (AOR). Over the past eight years, AFCEE has awarded six billion dollars worth of contracts in CENTCOM to support the contingency mission. This team provides reach back support for the majority of contracting, financial, and administrative duties in theater (Cassidy 2011).

### **USACE Construction Agency**

The US Army Corps of Engineers is a worldwide engineering and contracting agency for the US government. USACE has had an ever-increasing presence in the CENTCOM AOR since the start of the start of contingency operations in Afghanistan and Iraq. To fulfill the agency's growing requirements, the Transatlantic Division (TAD) headquartered in Winchester, Virginia was reactivated in September of 2009 as the ninth

major subordinate command under USACE. The TAD is responsible for engineering services in the CENTCOM AOR. The offices in Virginia provide reach back support to the district offices in theater to reduce their footprint. The TAD contains three district headquarters for contingency and reconstruction efforts in Iraq and Afghanistan. The Gulf Region District is in Baghdad, and there is one Afghanistan Engineer District North in Kabul and one South in Kandahar (TAD 2011).



**Figure 1 - USACE Structure (TAD 2011)**

The districts in Afghanistan are currently increasing their presence and mission while the Gulf Region District is drawing down. The AED North and South currently have approximately 500 Corps personnel in Afghanistan and the numbers are growing. The district in Iraq has drawn down to 350 members and is steadily declining from its peak of 1000 personnel as projects wrap-up (TAD 2011).

The USACE mission is different from AFCEE in that their mission is much broader and their human and technical support resources are much greater. For example: the districts in Iraq and Afghanistan provide in theater contracting and engineering support, allowing more timely and expert feedback to project managers in the field, whereas AFCEE relies on contracting support from their field operating agency based in San Antonio and engineering support is a contracted service (Roemhildt 2010).

### **Key Performance Indicators - Government**

Tracking project performance is important to ensure overall project success. Both USACE and AFCEE use Construction Contractor Appraisal Support System (CCASS) ratings to document contractor performance upon project completion. The rating system is a five-tier scale ranging from Unsatisfactory to Outstanding performance and is prepared by the government's QA representative, the resident engineer (COR/PM) and area engineer (PM or CO). This rating remains on the record of the contractor for several years and can impact future work not only in Iraq and Afghanistan, but also throughout the world when they choose to bid on construction projects (AED-N 2010). Both AFCEE and USACE use past performance ratings stored in this system as a factor to determine future contract awards (Cassidy 2011).

Department of Defense guidance suggests written feedback formed around the following performance measures:

1. *Quality of Work*
2. *Timely Performance*
3. *Effectiveness of Management*
4. *Compliance with Safety Standards*
5. *Compliance with Labor Standards*

According to CCASS policy Quality of Work is meant to rate, “the contractor’s management of the quality control program, as well as the quality of work” (DoD 2011). Some suggested areas for comment include: failure to identify and correct deficient work, inadequate reviews of materials or shop drawings, and inadequate quality control documentation. All areas receiving criticism are to provide supporting documentation and suggestions for improvement (DoD 2011). Therefore, it is crucial that these agencies keep accurate records and document performance to keep contractors and their agency’s PMs and QAs accountable.

### **Key Performance Indicators - Industry**

The construction industry argues that project success is often an abstract concept and difficult to measure. Beyond the “iron triangle” of cost, schedule and quality is an ongoing debate on what other important criteria should be used by the industry to measure quality and success. The use of multiple key performance measures is widely accepted, but their application varies from project to project (Parfitt and Sanvido 1993).

Chan, a prolific writer on the topic of construction success, suggested that projects are dependent on the outcome of several overarching critical success factors (CSFs) and also specific key performance indicators (KPIs). The CSFs are likened to overarching predictors of project success. Before a project begins, the formula of scope, procurement type, project management capability, participant teamwork, and environmental factors can be identified and accounted. KPIs are suggested to evaluate actual project performance as the construction commences through completion. There are many opinions what key performance indicators should be utilized (A. A. Chan 2004).

Several researchers argue that project success fits into two main categories: “the hard, objective, tangible, and measureable” and the “soft, subjective, intangible and less measurable” (A. P. Chan 2002). The objective criteria are measures such as time, cost, financial performance, and health and safety. The subjective include quality, meeting project objectives, functionality, productivity, satisfaction, dispute resolution, environmental factors, and aesthetics. Objective measures would be in terms of a percentage overrun or a specific target. Subjective measures would be evaluated from the opinions of key project participants with a qualitative measurement and quantitative measure or scale.

A meta-analysis of project criteria completed in 2002 showed the relative frequency of performance measures. In summary, the following measures were distilled further and the following were promoted by multiple studies:



**Table 1 - Industry Key Performance Measures**

<b><i>Industry Meta-Analysis of Key Performance Measures</i></b>			
<i>Objective Measures</i>	<i>Frequency</i>	<i>Subjective Measures</i>	<i>Frequency</i>
Time	15	Quality	15
Cost	15	Satisfaction	7
Health and Safety	6	Technical Specifications	3
Financial Performance	5	Productivity	3

Objective measures are often best evaluated be in terms of a percentage overrun for a specific target. Subjective measures would be evaluated from the opinions of key project participants with a qualitative measurement and/or a quantitative measure or scale (A. P. Chan 2002).

The industry desires to determine the most applicable criteria for a given project or contract type and the appropriate method of measurement, but there is no consensus. Little can be found to determine appropriate measures for success in a wartime or contingency environment in addition to industry findings for international construction (S. G. Arditi 2005). In order to determine the most appropriate measures of performance for Iraq and Afghanistan, it may be beneficial to determine what unique aspects of contingency construction impact the success of projects and adjust existing commercial industry measures. It may also be applicable to include statistical data and/or spatial references as additional subjective KPIs in these harsh and difficult construction environments (Baloi and Price 2002).

## **Project Performance Risk Factors in Iraq and Afghanistan**

Since the start of the Iraq reconstruction in 2003 the Government Accountability Office (GAO) has produced over 200 reports on the status of the stabilization and rebuilding of Iraq and Afghanistan. The reports cover a variety of topics and issues as a snapshot in time. They bring to light shortcomings and areas for improvement as each facet of the effort is evaluated. Aspects of contingency contracting and construction management are strewn throughout most these documents, while about two dozen focus primarily on DoD, US Department of State (State) and US Aid for International Development (USAID) construction contracts (GAO 2011).

### **Internal Performance Risks**

The majority of GAO reports focus on the need for internal organizational improvements. Items identified include the need for increased qualified contract administrative and oversight personnel, and improved contract planning, management and accountability techniques (GAO 2011). In a 2007 report, contract issues were said to be continuing specifically because of the DOD's inability to properly define and solidify requirements, risky contract arrangements without proper oversight, absence of leadership, and too few trained personnel to oversee contractor performance (Walker 2007).

**Table 2 - Internal Risk Factors**

<i>Internal Risk Factors</i>	
1.	Poor Strategic Contract Acquisition/Management
2.	Lacking Project Definition/Requirements
3.	Insufficient Number/Training of Acquisition Personnel
4.	Failure to Address Weaknesses in Contracting Arrangements
5.	Insufficient Number/Training of Construction Oversight Personnel

The factors in Table 2 highlight the recurring internal problems for major contingency construction efforts dating back to previous reports from conflicts produced in 1992 and again in 1997(Francis 2011). These factors are listed in order of frequency from numerous GAO reports and findings. The impact of these continuing problems make DoD contracts more vulnerable to fraud, waste, abuse and mismanagement. It also can result in higher costs, increased delays, and unmet project objectives among other issues (Walker 2007). The complicating factors of outside influences such as poor security, unskilled tradesmen, and faulty materials is said to heighten the impact of such problems and outcomes (Walker 2007, Thibault and others 2011, SIGAR 2011).

“The mismatch between wants, needs, affordability, and sustainability” often results in poor outcomes with an open-ended contract (Schinasi 2006). “Undefinitized” contract obligations are one example of a recurring shortcoming with high impact. For example, rapidly changing requirements led one project to be modified from \$1M to over \$200M in 2003. Difficulty in projecting construction costs has also led to large amounts of project delays and descoping (Schinasi 2006). For instance, water projects in Iraq

faced significant delays on 18 of 24 sites in 2005 due to scope conflicts ( J. A. Christoff 2005).

As noted in Table 2, insufficient numbers of qualified contract management personnel are a continued weakness in contingencies. One GAO report states the possible impacts: “If surveillance is not conducted, not sufficient, or not well documented, the DoD is at risk of being unable to identify and correct poor contractor performance in a timely manner and potentially paying too much for the services it receives” (Walker 2007).

GAO audits have been beneficial for identifying problems and tasks for improvement; however, the agencies are left to determine how best to fix the problem. This freedom allows the agencies to continue work while increasing their focus on certain issues, but it is difficult to examine strategies for systemic change when there is a mission to accomplish. The numbers of contracts and contractor personnel actions have almost doubled over the last decade, while the number of government employees managing these contracts has decreased. Most problems are often only partially fixed with new policies, guidance or training programs and the underlying issues remain largely unchanged. There is a movement in the DoD to in-source more expertise and better train and retain personnel, but there is still much work to be done (Francis 2011).

### **External Performance Risks**

External risks to contract performance play a substantial role in the success of overseas and especially contingency projects (GAO 2011, SIGAR 2011). However, there is little that organizations can do to predict and prevent externalities and

environmental factors (Baloi and Price 2002). The most an organization can do is to identify issues when selecting a project site and then mitigate the factors that cannot be changed. In several GAO reports it was mentioned that DoD agencies should take more precautions to know and understand the project site characteristics before developing a contract (GAO 2011, Thibault and others 2011).

Influential external risk factors to government contingency construction were recorded in multiple audits and reports. The following table illustrates the tabulation of the most predominant risk factors found in order of frequency:

**Table 3 - External Risk Factors**

<i><b>External Risk Factors</b></i>	
1.	Security- Attacks/Threats/Intimidation
2.	Supplies- Disrupted/Destroyed/Poor Quality
3.	Construction Workforce- Unskilled/Sabotage/Absent
4.	Site Conditions- Unforeseen/No Infrastructure
5.	Political- Changing Requirements/Extortion/Land Ownership
6.	Economic- Inflation/High Demand-Few Assets
7.	Maintenance- None/Unreliable

Each risk factor has the ability to have a lasting impact on overall project success. For example, “at one project, a lead employee received a life-threatening e-mail. The employee was subsequently chased by two armed men and fled the country” (J. A. Christoff 2005). The majority of his employees refused to come to work for weeks. In another instance three construction sites were identified, but after award two fell under contention due to squatters and a third had an environmental issue. The project was subsequently cancelled (J. A. Christoff 2005).

In an unstable external environment that requires frequently changing requirements, it is not difficult to understand how contracts can easily go over time and budget. The need for quick execution and obligation of funds often results in poorly defined contracts. In a location where security and political complications are the norm rather than the exception, it is not difficult to see why contracts overseas are high-risk endeavors (Walker 2007).

### **Construction Project Lifecycle**

The lifecycle of a large-scale construction project in Iraq or Afghanistan from identification to award and from construction start to final closeout involves several key players. In this section, the involvement of functional process owner will be discussed and then placed within the context of the project lifecycle. Then external influences and interactions will be introduced to illustrate a typical contingency construction project lifecycle.

### **Overseas Acquisition Process**

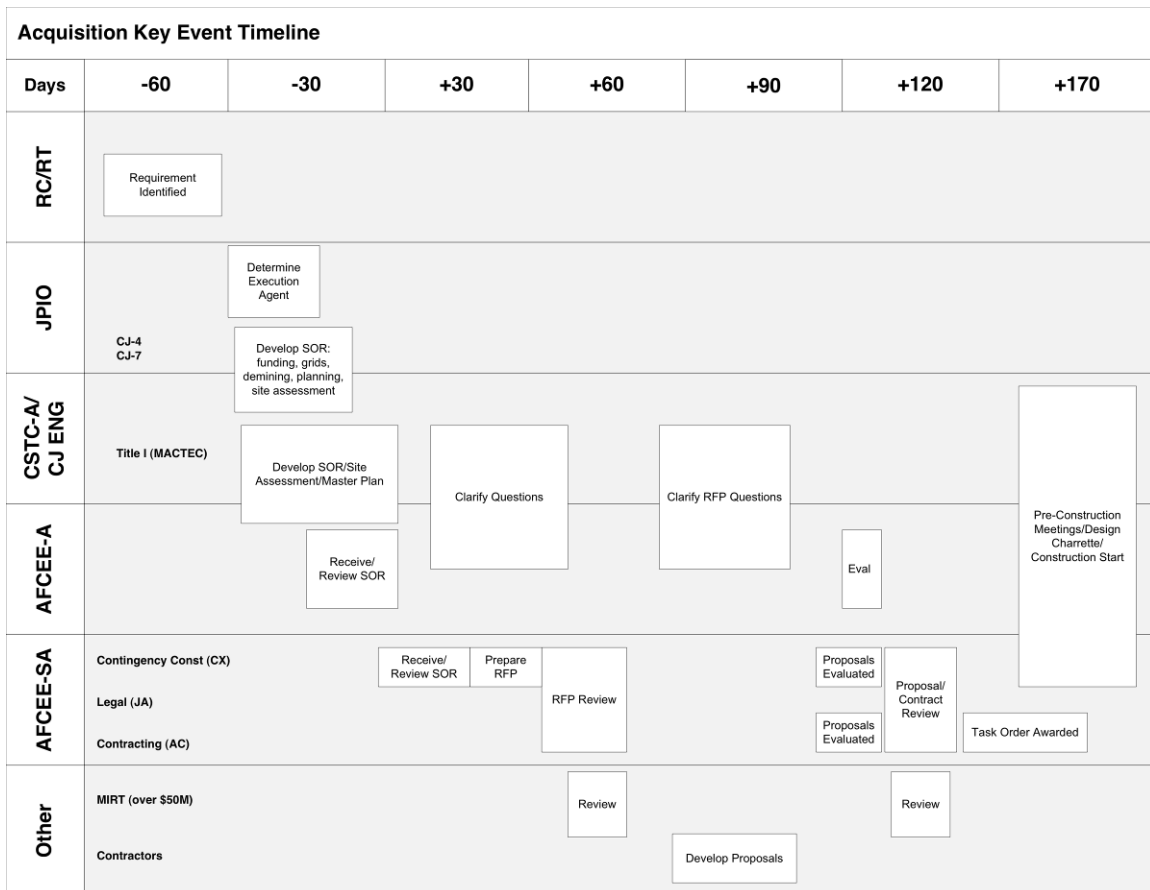
From the time a project is identified and taken on for execution until the time it is awarded, many layers of organizations have touched or molded the project’s resources,

requirements and expectations. Like most construction projects, the customer is the initiator. This customer may be a battlespace owner, a regional command's engineering cell, or from a military mentor group for a new government force that requests a project through their higher headquarters. For the USACE and AFCEE, the direct customer is usually the military engineer staff for the command in Iraq or Afghanistan. These military engineer staffs, the United States Forces-Iraq (USF-I) or the Combined Security Transition Command-Afghanistan (CSTC-A) are expected to provide funding, an initial site assessment and a statement of requirements for projects (Mayo 2010).

USACE or AFCEE is responsible for reviewing the project requirements and preparing a Request for Proposal (RFP) package for bid. The engineers assigned to the project are responsible for understanding the requirements requested and clarifying any questions for contracting personnel. The reach back cell either in country or stateside is responsible the RFP and much of the award process (Mayo 2010).

During the RFP build for AFCEE, the execution agent staff completes the statement of work, specifications and Independent Government Estimate (IGE). From there, legal, contracting and possibly a Multi-function Independent Review Team (MIRT) provide feedback and direction for change. Then the agent's contracting authority issues the RFP. The contractors deliver their proposals for evaluation and the staff has a panel of engineers perform technical evaluations. The agent in charge of the project completes a technical evaluation. Contracting conducts a price review. Then contracting selects the appropriate contractor based on a set of pre-determined criteria. Either Lowest Price Technically Acceptable or Best Value (Tradeoff) is chosen after a series of reviews with

legal and possibly a MIRT if over fifty million dollars. Then the project is awarded (Mayo 2010).



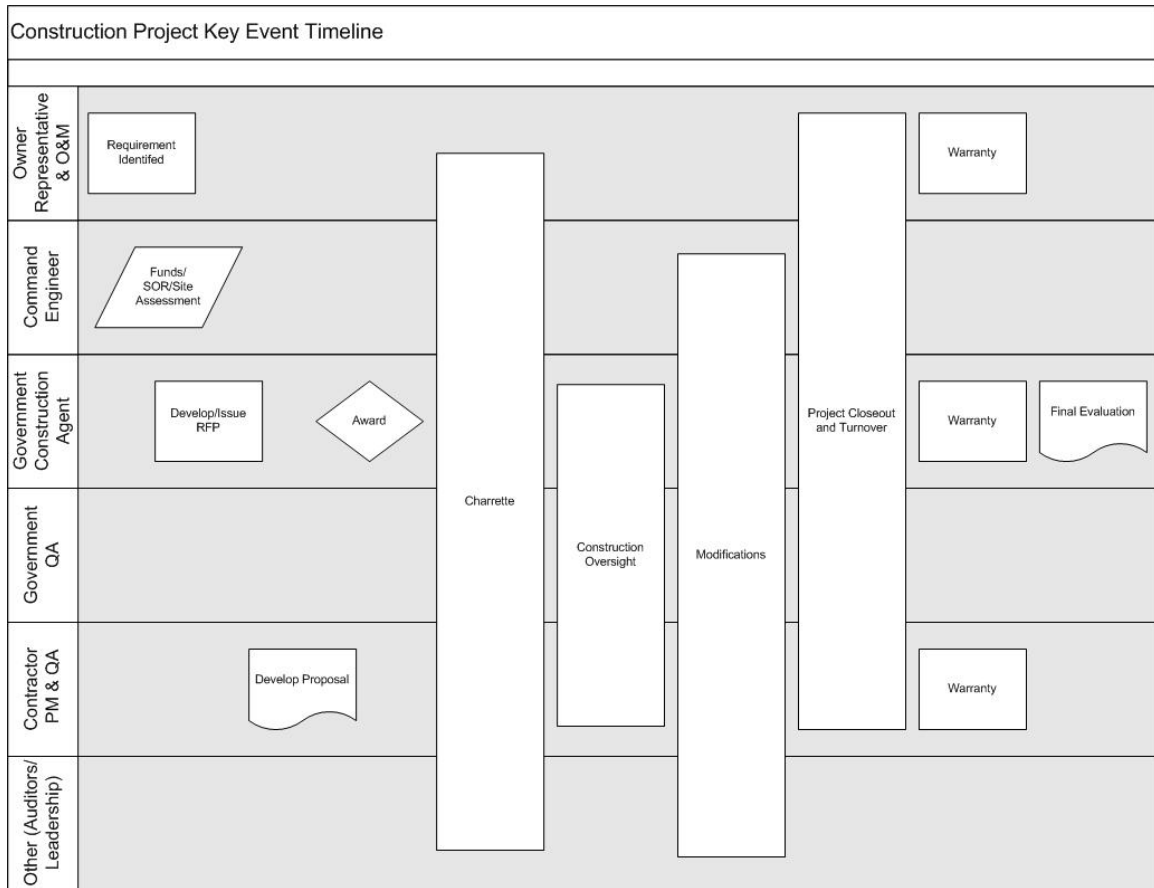
**Figure 2 - Acquisition Key Event Timeline (Mayo 2010)**



In Figure 2, the acquisition process is illustrated as a simplified timeline. In Chapter 3: Methodology, the acquisition timeline for AFCEE will be evaluated further to determine average contract award times in comparison to US construction.

### **Overseas Construction Management**

From the point of project award, the pre-construction through project closeout process begins. Like any other construction project there are: kick-off meetings, design reviews, weekly meetings, quality control and quality assurance discussions, invoice reviews, contract change processes, contractor evaluations, and turnover and closeout requirements. The following figure illustrates key participants throughout the contingency construction management process.



**Figure 3 - Construction Project Key Event Timeline (Mayo 2010)**

## AFCEE Construction Management Practices

For AFCEE there are a few interactions of interest to point out. Since there are only a few government representatives in theater, a large amount of project management occurs in San Antonio, rather than in Afghanistan or Iraq. For example, during the pre-construction phase, there are two kick-off meetings, one stateside with key players for the contracting relationships and another in country with the customer representatives, AFCEE-A and contractor representatives on the in theater. The first meeting is primarily

to define their roles and responsibilities for contracting. The second is to introduce the key players and interested parties while beginning discussion for design, construction, and enabling logistics and security requirements on the ground (Mayo 2010).

A second item of note for AFCEE construction is the use of contracted Title II Quality Assurance (QA) and GEITA engineering and construction support. The Third Country National (TCN) QA contactors provide daily supervision on the project site, “ensuring the construction contractor is properly implementing the quality control plan” (Mayo 2010). The QA provides reports, notices and inspection letters to the AFCEE-A COR/PM. They also have a cell that reviews technical drawing submittals. GEITA expatriates provide additional support to the COR/PM for management activities. The COR/PM is responsible for oversight on several projects so he or she is only present on the site whenever possible. The COR/PM is responsible to provide feedback to the stateside Contract Program Manager when any issues that cannot be dealt with in country arise. Letters of Concern, Corrective Action Requests and Cure Notices are all decided in AFCEE-SA by the Contracting Officer (CO) and COR/PM with AFCEE-A COR/PM input (Mayo 2010).

A third item of interest is AFCEE-SA COR/PM. This person is the stateside project manager that completes administrative duties and serves as the continuity for their Afghanistan or Iraq COR/PM counterpart. Since the deployed COR/PM is only in theater for 6 months at a time, this relationship is important to maintain. Items such as project performance documentation, requests for letters of concern, CCASS ratings, work change requests, and invoice reviews are all funneled to the AFCEE-SA COR/PM (Mayo 2010).

## **USACE Construction Management Practices**

For USACE there are also some unique processes to note. The first is their method of tracking project performance. The Corps uses their Resident Management System (RMS) to facilitate QA in the management of construction projects. All pertinent information regarding construction administration and Quality Control (QC) requirements is tracked for ease of oversight by this system. Since their project tracking process is similar to other USACE districts the amount of spin-up time is minimal for their personnel. The contractors are responsible to learn the system and provide continuous schedule and progress reports, input invoices and basic subcontractor information to ensure payments are made to all parties at appropriate times through this system (AED-N 2010).

The Corps also has over 26 COs and 81 CORs in Afghanistan. Their goal is to have as many personnel as possible deploy from stateside districts to support the staffing of their deployed districts in Iraq and Afghanistan. However, they have had some difficulty retaining qualified personnel in theater with their high staffing demand. They have hired some engineers from outside the government and have also offered a number of incentives to further increase their available personnel in theater. Some QA personnel have also been hired from the local populace (Dorko 2011).

A third point of interest is the USACE institution of an Intelligence Infusion Center (IFC). This center uses sensors and other technologies to perform some initial site selection planning. They are able to identify site characteristics such as terrain, soil condition, and location of local land use from afar. This further enables far-reaching

projects such as roads and sites that might be difficult to visit with manpower available (Dorko 2011).

## **Methodology Development**

The most frequently discussed methods for performance measure development and analysis are: various extensive literature reviews, expert questionnaires, Delphi studies, Analytic Hierarchy Processes (AHP), and Analysis of Variances (ANOVA) (S. G. Arditi 2005, Arditi and Gunaydin 1999, Hyun and others 2008, A. P. Chan 2002). To determine the most appropriate method for this research it is appropriate to review each methodology and its related outcomes.

## **Literature Review Coupled with Questionnaire**

Extensive literature reviews are helpful to gather all of the expert opinions on a subject and can be used to create a conceptual framework. However, literature alone can make it difficult to create an accepted consensus view for practical application. Expert questionnaires without extensive literature on the other hand result in a hierarchy of opinion, but there isn't much guidance in the process on generating additional concepts or comments. In addition, the use of survey questions alone has the potential to be poorly written or skew ideas and responses inadvertently without a check to balance the outcome (Okoli and Pawlowski 2004). By combining literature review and questionnaire development and analysis, it is possible to aggregate information categorically into logical patterns and to evaluate written comments through interpretation and checks with similar literature findings (Stake 1995).

## **Analysis of Variance**

Statistical analysis is a powerful tool for finding relationships within large amounts of data. Trend evaluation and correlations through the one-way bivariate analysis and analysis of variance (ANOVA) are common tools to identify interactions between independent and dependant variables. In the investigation of existing Iraq and Afghanistan project data, the completion of a bivariate analysis and the ANOVA will be the most useful.

One-way or bivariate analysis is used to determine the impact of a continuous independent variable,  $X$ , on a continuous dependent variable,  $Y$ . Bivariate analysis evaluates the relationship or correlation between only two variables at a time. The resultant output is an  $X$  versus  $Y$  scatter plot graph featuring a fit trend line, RSquare adjusted goodness of fit measure, and error rates (Paul Newbold 2010).

The one-way ANOVA is used to determine the impact of categorical independent variables,  $X_i$ , on the continuous dependent variable,  $Y$ . The result is a graph and statistical output depicting mean, mean difference, and percent deviations within  $X_i$  variables and the overall mean trend and between variables, with Prob > F, or Prob > t and p-values for standard error rates required to reject the null hypothesis (Institute 2012).

## **Evaluating Performance Indicators**

The selection of project performance measures has both objective and subjective elements, just as the measures themselves have these same attributes (A. A. Chan 2004). To determine the most appropriate performance measures for Iraq and Afghanistan, an

overarching method of analysis must be selected for this study. Since performance measures have been evaluated in construction industry by numerous combinations of quantitative and qualitative methods, a choosing by advantages decision-making tool was used to select the preferred method for this analysis (A. A. Chan 2004).

**Table 4 - CBA -Initial Methodology Selection**

***Choosing By Advantages - Initial Methodology Selection***

<i>Attributes</i>	<i>Alternatives</i>	
	<i>Quantitative</i>	<i>Qualitative</i>
<i>Evaluation Requirements</i>	Systematic/Through 30	Simple 50
<i>Product Attributes</i>	Numeric Scale/Rankings 30	Ideas Oriented 10
<i>Usefulness of Data</i>	Clear Prioritization 50	All Inclusive 20
<i>Ability to Collect Information</i>	Straightforward/Fast 35	Accessible/Easily Gathered/Focused on Expert Explanations 50
	<b>145</b>	<b>130</b>

Since a quantitative methodology was chosen as the most desirable, the results for performance measure analysis will be primarily evaluated numerically. The characteristics of a qualitative methodology also offer distinct advantages to better understand influencing factors on performance. Therefore, quantitative and qualitative measures were chosen for use in the methodology.

## **Methodology Selection**

For the purposes of this research the use of a combination of the survey and ANOVA will be utilized. First the survey method will be used to determine the most influential performance indicators and rank them with a panel of experts. An ANOVA will also be executed to evaluate existing objective performance data. The combination of methods will help to triangulate available data from literature review, expert opinions on performance criteria, and the evaluation of existing performance data. The result will assist in the determination of how we might effectively measure contingency contract performance in the future, so that the impact of contract type and other contingency risks can be evaluated.

## **Information Databases**

### **MACTEC Master Plans**

MACTEC is a Title I services contractor under AFCEE's 4PAE contract. Title I services can include all aspects of design as well as field surveys and investigations, contract plans and cost estimates. In Afghanistan, their primary tasks are basic field surveys and site master plans (Mayo 2010).



Each year MACTEC produces the Afghanistan National Security Forces (ANSF) Comprehensive Plan for Facilities Development. This electronic document compiles and outlines the topical data most leaders would request concerning ANSF base data. Most project files contain boundary site coordinates, a short narrative outlining current state and future plans, as well as maps, any facility plans and excel spreadsheets with cost data (MACTEC 2011).

### **AFCEE Project Tracking System (PTS)**

AFCEE's Project Tracking System (PTS) is an online data management system for task order (project) oversight. This system gathers data and generates reports on internal project management processes and also retains general project performance data and weekly task order progress reports. Under the Reports tab is the Project Management Reports tab which contains a data file entitled "Schedule Growth Metric" that keeps real time percent cost and schedule growth metrics for each AFCEE project. Another report entitled, "Acquisition Timeline Metric" retains the major handoffs and deadlines for task order solicitation and award. The reports cannot be queried online, so the files are MS Excel downloadable (Holguin 2011). These files will be discussed further in the methodology discussion of chapter 3.

### **USACE Resident Management System/Quality Control System (RMS/QCS)**

USACE's Resident Management System (RMS) is a networked data management system for multiple facets of project management. This system is used by government QA personnel to input management and administrative data to perform project planning and performance tracking. The other half of the system is the Quality Control System (QCS) which is accessible for use by construction contractors. Contractors are required to

provide all major construction administrative submittals and requests into this system.

The information from these systems is used by USACE to track contract performance and store it in a single location (AED-N 2010).

## **Chapter 3. Methodology**

### **Research Method**

The mixed method approach to research is the combination of quantitative and qualitative strategies. This concept was developed around the research philosophy that a single investigative approach is incapable of producing the accurate and reliable study on its own (Creswell 2003). When performing only quantitative analysis, data may be lacking or can possibly be misaligned from the topic of study (Hyun and others 2008). In some instances, quantitative results have been known to conflict with the perceptions of actual workers. In qualitative research, the wording of questions can inadvertently indicate an unintended or misinterpreted response (Creswell 2003, Okoli and Pawlowski 2004).

In the pragmatic approach of mixed methods, where quantitative measures are impossible to gather or are unable to explain phenomenon, qualitative tools are indispensable to turn soft measures and information into hard data. A quantitative analysis coupled with qualitative response and mixed methods analysis produces a more complete picture of an existing state (Creswell 2003). This research utilizes quantitative analysis on existing construction project data for cost and schedule performance in part I and uses a mix of qualitative and quantitative responses/analysis in the survey process in part II to validate the part I results and receive expert opinions on other performance indicators for construction success.

## **Statistical Analysis of Existing Project Data**

The online AFCEE Project Management System contained two useful reports with objective project performance data for Iraq and Afghanistan:

- 1. Acquisition Timeline Metric*
- 2. Cost and Schedule Growth Metric*

The project data in these files provided the basis for the statistical analysis of accessible existing performance measurements for this portion of study.

### **Acquisition Performance Analysis**

The Acquisition Timeline Metric is used to track the progress of each task order from the delivery of a Statement of Requirements (SOR) through actual award. Each project is identified by a title, independent government estimate, and awarded contractor title.

The first objective for analysis was to determine if any trends existed between process milestones and the efficiency of those process owners in comparison to the overall completion of the acquisition process. The second purpose was to determine if any statistical correlation exists between project scope, location, or fiscal year and the acquisition timeline execution.

To complete the bivariate analysis, the data from the Acquisition Timeline Metric was first entered into JMP<sup>®</sup> version 9, statistical analysis software. Any incomplete or missing project acquisition data was removed from the file. Data was also filtered so only construction task orders above \$2M were analyzed. This was done to eliminate a number of small projects that were deemed to be outliers during the initial data analysis.

These projects were small environmental, design, and Title I and II services, which are not part of the overall much larger project focused AFCEE contingency construction program which was the focus of this research.

Table 5 highlights the variables that were studied between internal acquisition process owners, the external variable of project scope and their impact on acquisition process completion.

**Table 5 - Acquisition Analysis Variables**

<i>X variable</i>	<i>Dependence</i>
<i>SOR to Contracting</i>	Internal Processes
<i>RFP Completion</i>	Internal Processes
<i>Proposal Received</i>	Internal Processes
<i>Award</i>	Internal Processes
<i>Government Estimate</i>	External to Process

By using the “*Fit Y by X*” tool in JMP<sup>®</sup>, the resultant analysis was a bivariate analysis for each independent (X) variable, acquisition process stage, against the dependent (Y)

variable, Overall Acquisition Time. Results and interpretation are discussed in Chapter 4: Results and Discussion.

### **Cost and Schedule Growth Analysis**

The second report that was analyzed was the Cost and Schedule Growth Metric. This metric tracks the percentage cost and time growth for each project. These two performance indicators are the quantitative tools currently utilized to help measure overall project health.

First, percent cost growth was analyzed with respect to the independent ( $X_i$ ) variables in Table 6 against the dependent ( $Y$ ) variable, Percent Cost Growth. This indicated if any ties existed between internal or external project factors and project cost growth. Second, percent schedule growth was analyzed with respect to the independent ( $X_i$ ) variables in against the dependent ( $Y$ ) variable, Percent Schedule Growth. This indicated if any ties exist between external project factors and project schedule growth.

**Table 6 - Cost and Schedule Variables**

<i>X variable</i>	<i>Agency Influence</i>
<i>Country</i>	External to Outcome
<i>FY</i>	External to Outcome
<i>Contractor</i>	Internally Controlled
<i>Award Value</i>	External to Outcome
<i>Contract Type</i>	Internally Controlled
<i>% Complete</i>	External to Outcome

To complete the analysis, the data from the Cost and Schedule Growth Metric was placed into the JMP<sup>®</sup> software program. Next, the projects were once again filtered to include only completed construction in Iraq and Afghanistan over \$2M for initial project cost. Then, the *Fit Y by X* statistical tool was used to initiate the one-way ANOVA, and then to pull the studentized pooled t-test statistics for the two-tailed probabilities.

The resultant one-way analysis and ANOVA outputs are tabulated and presented in Chapter 4, describing possible trends and the significance of the findings. The result of the Acquisition Performance analysis identifies if there are ties between various project factors and acquisition delays. The result of Cost and Schedule Growth Analysis will determine if these external project factors are tied to objective performance of AFCEE construction contracts in Afghanistan and Iraq to date.

## **Questionnaire**

The survey method of analysis was a multiple step procedure. A pool of expert participants associated with AFCEE construction was selected, a set of questions was developed based on similar survey samples found and reviewed for any bias, the survey was administered, and a statistical analysis of the results was accomplished. Potential survey participants were identified based on their position and experience with construction operations within Afghanistan or Iraq. The selection of personnel was based on a literature review of documents identifying key positions involved in construction during the life of a construction project. Expatriate, third country, and local construction contractors, planners and quality assurance personnel were the target survey participants.

The survey was administered by AFCEE staff in Afghanistan and was conducted voluntarily and confidentially through a web-based questionnaire. Questions were developed based on survey formats found for similar past studies and from key performance measures and risk factors from the literature review. The questionnaire invitation and web-link was sent directly through e-mail to leaders in all the organizations involved with AFCEE construction in Iraq and Afghanistan and then could be forwarded to its employees. Demographic questions were used only identify the depth of the sample population in terms of the positions and amount experience levels that were represented in the results. Demographic information is available in Appendix D: Survey Data and Analysis.

## **Measures**

The questions were developed based on identifiers and measures of project success compiled from the literature review. The questions were designed to bring out



the most influential impacts to project success for Cost Plus Fixed Fee and Firm Fixed Price contracts, ranging from internal organizational structures to external causes, such as security threats.

The questionnaire consisted of four parts and a total of 39 questions on their expert opinions of contingency contracts and 6 demographics questions. The questions were designed to measure if there were any differences between Cost Plus and Firm Fixed Price contracts for: each construction stage, the influence of internal factors, the influence of external factors, and overall performance. The questionnaire also included a comments section for each question, a chance to suggest additional influencing factors and scale their impact at the end of the main questionnaire, and a chance to give their opinions on construction in Iraq and Afghanistan and views on the strengths and weaknesses of each contract type in the part four, comments section. All questions in parts one through three were measured using a 7-point Likert-type response scale. Questions in part four were for written comments only. The questionnaire that was deployed can be found in Appendix B. The statistical analysis completed to evaluate the responses and the results are discussed in Chapter 4.

#### *Part One.*

Seven questions were asked relating to how influential the decisions at each stage of the construction process and overall impact on the success of projects. An example question is, “How influential is the execution of the Design Stage on overall project success with respect to time, cost, and quality?” For each question the participant responded with respect to cost, time, and quality impacts to both Cost Plus and Firm

Fixed Price contracts. The hypothesis was that the impact to success would differ for Cost Plus and Firm Fixed Price during each stage of the process, due to the nature of the costs and benefits inherent in the contract types for each player. For example, it might be expected that the success of the design stage would be most influential for time and cost for Cost Plus, because requirements are generally assumed to be less well-defined by the government.

*Part Two.*

Thirteen questions were asked relating to how much internal project factors affect the success of projects. Internal factors are persons, places or things that are within your organization's realm of influence. Factors may include: organizational processes and support structures, employees, and quality of deliverables. In this survey internal factors were drawn from previous trends found in studies by the GAO, SIGIR, SIGAR, and Congressional Commissions as described in the literature review. An example question from the survey is, "How influential are the Number and Availability of Trained Acquisition Personnel on the success of a contract?" For each question the participant responded with respect the degree of impact to overall success for Cost Plus and also Firm Fixed Price contracts. Previous studies from the GAO formed the hypothesis for this section that internal factors may contribute more to the success or failure of a project than external factors.

*Part Three.*

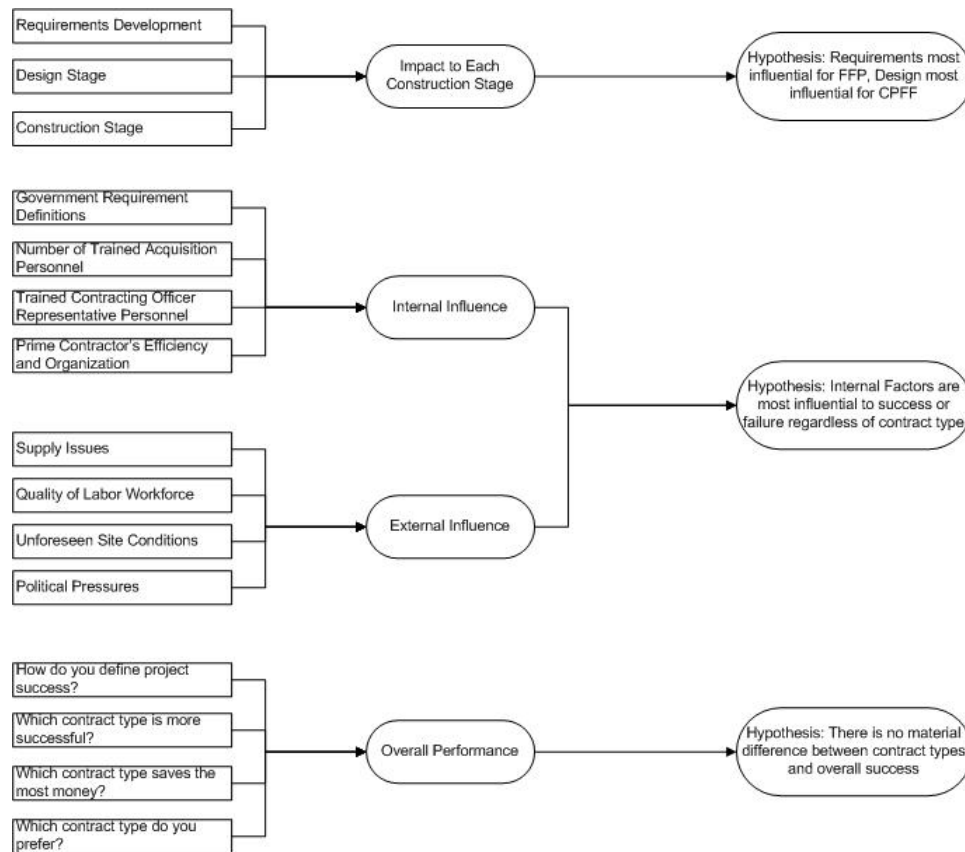
Ten questions were asked relating to how much external project factors affect the success of projects. External Factors are persons, places or things that are outside of your

realm of influence. Such factors include: weather, terrorists, economic conditions, and other environmental factors outside of an organization's control. In this survey some of the most commonly noted external factors were also drawn from previous trends found in studies described in the literature review. An example question from the survey is, “To what degree do Local Political Pressures impact the success of a contract?” For each question the participant responded with respect the degree of impact to overall success for Cost Plus and also Firm Fixed Price contracts. At the end of this section participants were given the opportunity to suggest any internal or external factors not mentioned and rate their impact on success.

#### *Part Four.*

Eight questions were asked relating to overall thoughts on project success and contract types. Four questions requested the respondents to use the open comments section to describe their opinion and the government’s opinion of project success, and their opinion on which contract vehicle was the best. The final four questions were a simple selection of which is better: Cost Plus or Firm Fixed Price. The hypothesis for this section was that neither contract type was better than the other in terms of overall success in a contingency environment. Also, that each would have unique advantages and disadvantages with respect to cost, time, and quality.

The following, shown in Figure 4, illustrates the nature of questions that were posed in each section of survey. The map shows how the questions attempt to shed light not only on the myriad of influencing factors on construction in the AOR, and also shows how those factors map to three overarching hypotheses of the survey.



**Figure 4 - Questionnaire Map to Hypotheses**

This section described the participants and the design and deployment of the contract type questionnaire. The description of the statistical analysis, final results, and discussion of the questionnaire are included in Chapter 4. The questions, responses,

calculations, and additional data are available for review in Appendix B: Cost Plus Versus Firm Fixed Questionnaire and Appendix D: Survey Data and Analysis.

## Chapter 4: Results and Discussion

### Acquisition Performance Results

A bivariate *Fit Y by X* analysis was conducted for the acquisition timeline report data. Both variables remained as continuous data. This was done to see if there was a pure correlation (effect created) between the time it takes to a process owner to accomplish their tasks and its impact on the time it takes to complete the overall acquisition process.

Table 7 - Acquisition Performance

<i>Acquisition Performance</i>					
<i>X variable (days/\$)</i>	<i>Process Owner</i>	<i>adjR<sup>2</sup></i>	<i>Trend</i>	<i>Prob &gt; F</i>	<i>Statistically Significant</i>
<i>SOR to Contracting</i>	Field Workers	0.48	Some Impact	0.0001	Y
<i>RFP Completion</i>	Agency/ Contracting	0.31	Some Impact	0.0001	Y
<i>Proposal Received</i>	Contractors (Virtue of Scope)	0.03	No Impact	0.0846	N
<i>Award</i>	Agency/ Contracting	0.34	Some Impact	0.0001	Y
<i>Government Estimate</i>	(Virtue of Scope)	-0.01	No Trend/ Impact	0.8285	N

As shown in Table 7, the values that indicate a possible correlation for this analysis technique are RSquare Adjusted Values and Prob > F (p-value). If RSquare is greater than 0.50 it is possible a strong correlation may exist, and if Prob > F is less than 0.05 then the results are statistically significant. The results indicate that field workers developing the Statement of Requirements tend to have the greatest positive or negative impact on the acquisition process and time to award, followed by the contract award phase and then the Request for Proposal phase of the acquisition process.

### **Statistical Cost and Schedule Growth Results**

A combination of bivariate (simple regression) and Means/ANOVA and studentized t-test statistics were executed in JMP<sup>®</sup> in this statistical cost and schedule growth analysis. Data from a total of 127 AFCEE construction projects from Iraq, Afghanistan, and the United States awarded in fiscal year 2006 through 2010 were used for this study. The first tables for cost and schedule growth focus on the overall performance of construction contracts in Iraq and Afghanistan. The second tables for cost and schedule growth go more in-depth to evaluate performance characteristics based on contract type, country, fiscal year, and percent of construction complete at the time of the analysis.

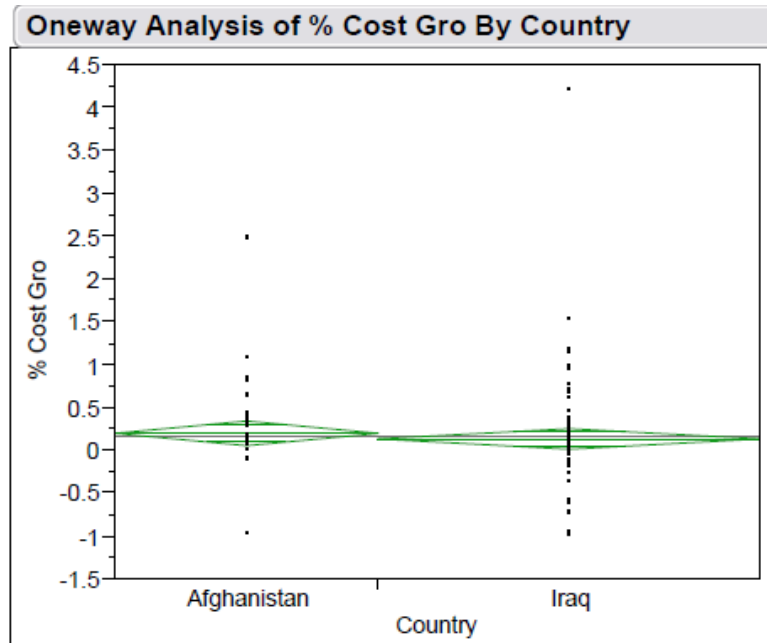
Table 8 shows the results of bivariate and one-way analyses and indicates percent cost growth trends of note for overall construction performance in Iraq and Afghanistan.

**Table 8 - External Factors and Percent Cost Growth**

<i>External Factors and Percent Cost Growth</i>					
<i>X variable</i>	<i>Trend (Visual Inspection)</i>	<i>Best Performance (Visual Inspection)</i>	<i>adjR<sup>2</sup></i>	<i>Prob &gt; F</i>	<i>Statistically Significant</i>
<i>Country</i>	N/A	Iraq > Afghanistan	0.00	0.4886	N
<i>FY</i>	Negative Linear	FY 2010	-0.02	0.8375	N
<i>Contractor</i>	N/A	Contractors 4 & 13	N/A	0.0846	N
<i>Award Value</i>	Logarithmic	Large Projects Perform Better	0.01	0.0111	Y

The values in the table that indicate a possible correlation for this analysis technique are RSquare Adjusted Values and Prob > F. If RSquare is greater than 0.50 it is possible a strong correlation may exist, and if Prob > F is less than 0.05 then the results of the regression are statistically significant. The results indicate that there is only one statistically significant result. Still, a few trends were discovered by visual inspection of the data and were indicated. It appears that larger projects tend to have less cost growth, two contractors have less cost growth than the others, and that over time, Iraq and Afghanistan have improved as indicated by a declining percent cost growth trend for completed projects. These trends cannot be validated, because the results are not significant. An example of a one-way means/ANOVA output from JMP® is shown in Figure 5.





**Figure 5 - Example ANOVA Output**

Table 9 shows the results of the more in-depth analysis of cost growth for AFCEE contracts. The first section evaluates Afghanistan and US Firm Fixed Price (FFP) construction performance. AFCEE in Iraq did not execute FFP construction. The second section compares FFP and Cost Plus Fixed Fee (CPFF) contract performance in Afghanistan. The third analyzes CPFF in Afghanistan versus Iraq.

The mean values are the average percent cost growth, the difference is the comparison of the two means (i.e. US, FFP, > 95% complete versus Afghanistan, FFP, >

95% complete). The Upper and Lower 95% give the 95% confidence interval for the true difference between the means. If the confidence interval contains zero then there is no significant difference. The p-value is the two-tailed test for rejection the null hypothesis that the mean difference is zero. If the p-value is less than 0.05 the null is rejected and we can conclude there is a significant difference between the means. The Prob > F is the two-tailed p-value for the significance of the overall model.

**Table 9 - Percent Cost Growth**

Percent Cost Growth										
Contract Type	Country	FY	% Complete	Mean	Mean Difference	Upper 95%	Lower 95%	p-Value	Prob > F	Significant Difference
FFP	US	2007-2011	> 95%	0.095	0.060	0.353	-0.233	0.6790	0.2100	N
	Afghanistan			0.156						
	US		< 95%	0.004	0.046	0.277	-0.184	0.6864		N
	Afghanistan			-0.042						
CPFF	Afghanistan	2007-2011	> 95%	0.339	0.183	0.369	-0.003	0.0531	0.0001	N
FFP				0.156						
CPFF			< 95%	0.123	0.166	0.332	-0.001	0.0514		N
FFP				-0.042						
CPFF	Afghanistan	2007-2011	> 95%	0.339	0.094	0.341	-0.153	0.4530	0.0028	N
	Iraq			0.245						
	Afghanistan		< 95%	0.123	0.570	1.014	0.125	0.0125		Y
	Iraq			-0.446						
CPFF	Afghanistan	2007-2008	> 95%	0.308	0.151	0.388	-0.086	0.2111		N
	Iraq	2008		0.157						
CPFF	Afghanistan	2009-2011	> 95%	0.193	0.114	0.414	-0.185	0.4518	0.1734	N
		2007-2008		0.308						
CPFF	Afghanistan	2009-2011	> 95%	0.193	0.170	0.452	-0.113	0.2366		N
FFP		2011		0.024						

It is interesting to note that although the US tends to outperform Afghanistan on the completed FFP projects that were evaluated, there is not a statistically significant difference between the percent cost growths of these two countries. Also, FFP in Afghanistan does appear to also outperform the whole of CPFF projects executed in Afghanistan, but there is not a statistically significant difference to overturn the null that the means are the same. Iraq projects also had a lower mean average percent cost growth than Afghanistan, but the results were not conclusive.

Percent schedule growth bivariate analysis results in Table 10 were analyzed and calculated in the same way as the results in Table 8 - External Factors and Percent Cost Growth.

**Table 10 - External Factors and Percent Schedule Growth**

<i>External Factors and Percent Schedule Growth</i>					
<i>X variable</i>	<i>Trend (Visual Inspection)</i>	<i>Best Performance (Visual Inspection)</i>	<i>adjR<sup>2</sup></i>	<i>Prob &gt; F</i>	<i>Statistically Significant</i>
<i>Country</i>	N/A	Afghanistan > Iraq	0.01	0.1214	N
<i>FY</i>	Negative Linear	FY 2010	0.12	0.0001	Y
<i>Contractor</i>	N/A	Contractors 4 & 9	N/A	0.2967	N
<i>Award Value</i>	Logarithmic	Large Projects Perform Better	0.00	0.4052	N

There is a statistically significant finding for this analysis that indicates a slight improvement in reducing schedule growth over time for both Iraq and Afghanistan construction. It is also interesting to point out that contractor 4, which performed well in terms of average cost growth, also appears to have had less schedule growth on average. The same trend was also found in percent schedule growth as was found for percent cost growth that larger projects tend to perform better.

The results in Table 11 for percent schedule growth were evaluated in the same fashion as percent cost growth in Table 9.

**Table 11 - Percent Schedule Growth**

<i>Percent Schedule Growth</i>										
<i>Contract Type</i>	<i>Country</i>	<i>FY</i>	<i>% Complete</i>	<i>Mean</i>	<i>Mean Difference</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>p-Value</i>	<i>Prob &gt; F</i>	<i>Significant Difference</i>
FFP	US		> 95%	N/A						N/A
	Afghanistan	2008-		0.411	N/A	N/A	N/A	N/A		
	US	2011	< 95%	0.000					0.2168	
	Afghanistan			0.283	0.283	0.717	-0.150	0.1923		N
CPFF				1.176						
FFP	Afghanistan	2007-	> 95%	0.411	0.765	1.254	0.276	0.0026		Y
CPFF		2011	< 95%	0.513					0.0001	
FFP				0.283	0.229	0.668	-0.209	0.3004		N
CPFF	Afghanistan		> 95%	1.176						
	Iraq	2007-		1.010	0.166	0.545	-0.213	0.3872		N
	Afghanistan	2011	< 95%	0.513					0.0001	
	Iraq			-0.325	0.838	1.518	0.157	0.0164		Y
CPFF	Afghanistan	2007-	> 95%	1.214						
	Iraq	2008		0.841	0.374	0.753	-0.006	0.0538		N
		2009-		0.574						
CPFF	Afghanistan	2011	> 95%		0.641	1.121	0.161	0.0093	0.0002	Y
		2007-		1.214						
		2008								
CPFF	Afghanistan	2009-	> 95%	0.573						
FFP		2011		0.326	0.247	0.702	-0.207	0.2838		N

There was too little US data containing percent schedule growth of completed projects to perform an analysis of that parameter. There were statistically significant differences between the mean percent schedule growth of completed CPFF and FFP projects in Afghanistan. Firm Fixed Price does outperform Cost Plus. It also appears that incomplete projects from Iraq had less schedule growth than those underway in Afghanistan based on the data evaluated at the time. In terms of country specific improvements, the comparison of CPFF projects in Afghanistan from 2007 to 2008 with 2009-2011 showed a statistically significant improvement over time.

## **Questionnaire Results**

There were 20 responses to the questionnaire from the AFCEE initiated online survey. Program and project managers, government and contractor, quality assurance personnel, and construction leadership and contracting personnel were invited to participate in the study. There was representation from all of these fields, to include personnel with past experience as project engineers, and site superintendents. Average construction experience in Iraq and Afghanistan for the sample was 5.2 years. Average number of years in the field of construction was 24.5 years. More detailed demographic information can be found in Table 25 - Demographics Data located in Appendix D: Survey Data and Analysis.

## **Overall Questionnaire Results**

The first three tables in the analysis show the statistical analysis of our overall survey responses by category. All data analysis was performed through a paired t-test utilizing a matched pairs analysis. The Upper and Lower 95% and Prob > t indicate if there is a significant difference between the two means (CPFF vs. FFP responses).

**Table 12 - Construction Phases and Overall Impacts to Performance**

<i>Construction Phases and Overall Impacts to Performance</i>								
<i>Question</i>	<i>Mean</i>						<i>Significant</i>	
	<i>FFP Mean</i>	<i>CPFF Mean</i>	<i>Difference</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Correlation</i>	<i>Prob &gt; t</i>	<i>Difference</i>
1. Initial Planning Cost	5.632	4.947	0.684	1.662	-0.294	-0.01	0.1589	N
1. Initial Planning Time	5.895	5.368	0.526	1.495	-0.443	0.16	0.2687	N
1. Initial Planning Quality	4.526	4.316	0.211	1.461	-1.040	0.10	0.7277	N
2. Design Stage Cost	5.895	5.263	0.632	1.515	-0.252	0.31	0.1503	N
2. Design Stage Time	5.895	5.158	0.737	1.848	-0.374	-0.22	0.1806	N
2. Design Stage Quality	4.632	4.579	0.053	0.780	-0.674	0.69	0.8808	N
3. Construction Stage Cost	5.947	5.474	0.474	1.416	-0.468	-0.02	0.3047	N
3. Construction Stage Time	5.947	5.579	0.368	1.437	-0.700	-0.08	0.4780	N
3. Construction Stage Quality	5.000	5.684	-0.684	0.225	-1.594	0.48	0.1314	N
4. Red Zone Cost	4.300	4.550	-0.250	0.410	-0.910	0.73	0.4375	N
4. Red Zone Time	4.800	4.750	0.050	0.685	-0.585	0.72	0.8708	N
4. Red Zone Quality	4.400	4.850	-0.450	0.064	-0.964	0.84	0.0828	N
5. Overall Impact Cost	5.200	5.200	0.000	1.205	-1.205	-0.01	1.0000	N
5. Overall Impact Time	5.250	5.000	0.250	1.590	-1.090	-0.10	0.7005	N
5. Overall Impact Quality	3.450	4.950	-1.500	-0.661	-2.339	0.47	0.0014	Y
6. Overall Success Cost	4.200	5.000	-0.800	0.677	-2.277	-0.56	0.2710	N
6. Overall Success Time	5.050	4.550	0.500	1.590	-0.590	0.12	0.3489	N
6. Overall Success Quality	3.737	6.263	-2.526	-1.627	-3.426	-0.08	0.0001	Y

The first table compiles the responses for construction phases. The only comparisons of the contract type means that were statistically significant were the overall influence on performance and the success of projects with respect to quality. CPFF contracts had the most influence and success for both responses. For both FFP and CPFF the construction phase had the greatest influence on the overall cost of projects, followed by design, planning and finally red zone. For time influences, the most crucial stage was construction followed by a tie between planning and designs for FFP, and for CPFF design followed by planning. For quality, the most influential stages were construction, design, and then red zone. These results indicate that our original hypothesis was incorrect. The construction stage, instead of the initial planning and requirements stage

was the most influential on success of FFP. And the construction stage, not the design stage was the most influential on success of CPFF.

**Table 13 - Internal Impacts to Performance**

<i>Internal Impacts to Performance</i>								
<i>Question</i>	<i>Mean</i>		<i>Difference</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Correlation</i>	<i>Prob &gt; t</i>	<i>Significant Difference</i>
	<i>FFP Mean</i>	<i>CPFF Mean</i>						
7. User Expectations	4.050	5.750	1.700	2.662	0.738	0.03	0.0015	Y
8. Government Requirements Defined	3.450	3.450	0.000	0.241	0.504	0.74	1.0000	N
9. Meeting Design Requirements	4.611	3.500	1.111	1.962	0.260	0.55	0.0135	Y
10. Meeting Construction Requirements	4.500	3.900	0.600	1.529	-0.329	0.37	0.1921	N
11. Strategic Decisions/Planning	5.100	4.150	0.950	1.686	0.214	0.63	0.0141	Y
12. Trained Government Acquisition Personnel	5.800	5.100	0.700	1.290	0.110	0.51	0.0225	Y
13. Trained Government Construction Oversight Personnel	5.400	5.350	0.050	0.801	-0.701	0.37	0.8907	N
14. Trained CORs	5.400	5.050	0.350	1.113	-0.413	0.52	0.3493	N
15. Contractor Efficiency/Organization	6.000	5.950	0.050	0.801	-0.701	0.21	0.8907	N
16. Internal Security Incidents	4.700	4.150	0.550	1.286	-0.186	0.54	0.1342	N
17. Internal Supply Issues	5.421	4.842	0.579	1.228	-0.070	0.43	0.0772	N
18. Accidents/Safety Violations	3.667	3.833	-0.167	0.224	-0.558	0.93	0.3808	N
19. Warranty Issues	4.158	3.737	0.421	1.348	-0.506	0.52	0.3528	N
20. Overall Internal Cost	4.947	5.368	-0.421	0.387	-1.229	0.41	0.2882	N
20. Overall Internal Time	5.368	5.632	-0.263	0.470	-0.997	0.22	0.4607	N
20. Overall Internal Quality	5.263	5.579	-0.316	0.286	-0.918	0.57	0.2852	N

Table 13 - Internal Impacts to Performance, was developed to rate the most influential internal influencing factors on construction success in terms of CPFF and FFP contracts. There were several statistically different performance factors resulting from the analysis. User expectations for example were believed to have more impact on the



success of a CPFF contract versus FFP. Overall, the most influential internal impact on performance was the contractor's efficiency and organization. For FFP the next most influential performance factors were the number of trained government acquisition personnel, followed by internal supply issues. The next most influential for CPFF were handling user expectations, followed by trained construction oversight personnel. The least influential for FFP and CPFF were accidents and safety violations followed by the quality of the government's definition of project requirements. The overall impact to cost, time, and quality by internal factors had the most influence on the success of CPFF projects. Time, followed by quality were the most impacted performance measures from internal influences.

External influencing factors on performance were evaluated next. Table 14 shows the results of the analysis.

**Table 14 - External Impacts to Performance**

<i>External Impacts to Performance</i>								
<i>Question</i>	<i>Mean</i>					<i>Significant</i>		
	<i>FFP Mean</i>	<i>CPFF Mean</i>	<i>Difference</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Correlation</i>	<i>Prob &gt; t</i>	<i>Difference</i>
21. External Supply Issues	5.450	5.000	0.450	1.006	-0.166	0.66	0.1429	N
22. Construction Labor	5.211	5.579	-0.368	0.571	-1.308	0.42	0.4209	N
23. Subcontractor Workforce	5.700	5.900	-0.200	0.598	-0.998	0.23	0.6058	N
24. External Security Incidents	4.900	4.400	0.500	1.117	-0.117	0.72	0.1061	N
25. Unforeseen Site Conditions	5.000	4.211	0.789	1.633	-0.054	0.52	0.0649	N
26. Site Location	5.550	4.900	0.650	1.428	-0.128	0.47	0.0966	N
27. Local Political Pressures	5.000	4.200	0.800	1.455	0.145	0.61	0.0193	Y
28. Local Economic Factors	4.632	3.789	0.842	1.529	0.156	0.65	0.0190	Y
29. Warranty Claims	5.000	4.500	0.550	1.388	-0.288	0.53	0.1856	N
30. Overall External Cost	4.800	4.250	0.550	1.237	-0.137	0.64	0.1102	N
30. Overall External Time	5.000	4.100	0.900	1.401	0.399	0.77	0.0013	Y
30. Overall External Quality	4.050	3.600	0.450	0.865	0.035	0.87	0.0351	N

There were few statistical differences in this section and the perceived impact of those measures on performance was minimal. Overall, the most influential external impact on performance was the subcontractor workforce. For FFP the next most influential was site location followed by external supply issues. For CPFF the next influential measures were construction labor workforce and external supply issues. The least influential factor for both was local economic factors. The overall impact to time, cost, and quality were most influential on FFP contract success. For FFP external factors had the most perceived impact on time, followed by cost. For CPFF cost and time were perceived as the most influential. These responses appear to line up with the traditional definitions of cost type and firm fixed type contracts and their influences on dealing with project risk (GSA 2010).

The next table discusses the results of an overall compilation and analysis of the first two questionnaire sections.

**Table 15 - Overall Survey Responses**

<i>Overall Survey Responses</i>								
<i>Test</i>	<i>Mean</i>			<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Correlation</i>	<i>Prob &gt; t</i>	<i>Significant Difference</i>
	<i>FFP Mean</i>	<i>CPFF Mean</i>	<i>Difference</i>					
All Survey								
Questions	3.258	3.618	-0.360	-0.237	-0.482	0.503	0.0001	Y
Cost								
Influences	3.269	3.410	-0.141	0.178	-0.460	0.461	0.3840	N
Time								
Influences	3.308	3.481	-0.173	0.151	-0.498	0.429	0.2936	N
Quality								
Influences	3.619	3.916	-0.297	0.008	-0.601	0.522	0.0559	N
Internal								
Influences	3.138	3.807	-0.669	-0.358	-0.981	0.358	0.0001	Y
External								
Influences	3.062	3.390	-0.328	-0.063	-0.583	0.508	0.0156	Y

The first test combined the outputs of all quantitative survey responses with regards to CPFF and FFP contracts. There was a significant difference in the perceived performance of the two contract types overall and Cost Plus construction contracts were believed to perform better in Iraq and Afghanistan. Hypothesis number three from our questionnaire analysis was that there was no overall difference between contract types and project success. This hypothesis was rejected. In terms of cost, time, and quality, it appeared that CPFF projects performed better than FFP, and the statistical results indicate they are not statistically conclusive. In terms of the impact of internal and external influences on the contracts, the results concluded that there was a significant difference in performance and CPFF projects were impacted the most positively in their experience.

Table 16 provides some more in-depth survey response comparisons. Time and Cost and Quality were evaluated against each other to determine statistically significant

comparisons of the overall data. The same was done for overall internal and external project influences.

**Table 16 - Additional Survey Response Comparisons**

<i>Additional Survey Response Comparisons</i>								
<i>Test</i>	<i>Time</i>	<i>Cost</i>	<i>Mean Difference</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Correlation</i>	<i>Prob &gt; t</i>	<i>Significant Difference</i>
Time vs Cost	3.392	3.347	0.045	0.203	-0.113	0.731	0.5754	N
Quality vs Cost	Quality	Cost						
	3.768	3.347	0.421	0.664	0.179	0.378	0.0007	Y
Quality vs Time	Quality	Time						
	3.768	3.392	0.376	0.595	0.157	0.488	0.0008	Y
Internal vs External Influences	External	Internal						
	3.251	3.749	-0.497	-0.222	-0.772	-0.059	0.0004	Y

There was a strong consensus that quality was impacted most in a contingency environment. There was also a strong indication that internal influencing factors had the greatest impact on construction success overall. Hypothesis two for the questionnaire conjectured that internal factors were more influential on project success regardless of contract type. According to the survey analysis, the null hypothesis stands, and cannot be rejected.

In Table 17 compares responses of time, cost, and quality for CPFF and FFP. The perceived impact on quality for CPFF and FFP is significantly more influential than from

cost and time performance, and CPFF quality impacts are significantly more significant than FFP quality.

**Table 17 - Additional Survey Response Comparisons - Cost, Time, Quality In-depth**

<i>Additional Survey Response Comparisons - Time, Cost, Quality In-depth</i>							
<i>Test</i>	<i>Mean</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>p-Value (A)</i>	<i>p-Value (B)</i>	<i>Significant Difference (A)</i>	<i>Significant Difference (B)</i>
CPFF Cost	3.410	3.715	3.106	0.0216	0.3354	Y	N
CPFF Quality	3.916	4.222	3.611	N/A	0.1810	N	Y
CPFF Time	3.481	3.785	3.176	0.0480	0.5207	Y	N
FFP Cost	3.269	3.574	2.965	0.0033	0.1086	Y	N
FFP Quality	3.622	3.926	3.317	0.1810	N/A	N	N
FFP Time	3.308	3.612	3.003	0.0058	0.1528	Y	N

### **Additional Influencing Factors**

The next portion of data collection allowed the participants to suggest additional internal or external influencing factors on performance of the two construction contract types. Table 18 distills the number responses provided and the perceived impact by the respondent.

**Table 18 - Additional Factors Suggested for Consideration**

<i><b>Additional Factors Suggested for Consideration</b></i>		
<i>Factor (Comments)</i>	<i>CPFF Impact to Success</i>	<i>FFP Impact to Success</i>
Staff retention and contingency construction experience (CPFF supports retainage of experienced workers focused on client and predictable requirements and FFP creates conflict and stress for workers and higher turnover)	3	6
Ethical challenges due to corruption (CPFF supports ethical decision-making, FFP stressors provides greater risk for ethical decision-making)	1	6
Best value	7	1
Long term sustainability	7	1
Lack of awareness of operating theater difficulties	6	6
Failure to learn and incorporate experience in new projects	6	6
Team approach - quality of government & contractor relations (Difficulty with: adversarial relationships, lessons learned, oversight, compromise, approving field changes, providing timely approvals)	5	6
Lack of trained government COR personnel (No experience in contingencies or risk management in contracts)	5	7
Contract turnover of CORs	5	7

There was a particular interest from the respondents that improvement of government COR staff retention and experience was especially important to contract success. However, question 14 from the questionnaire also attempted to quantify the same impacts on success. The mean responses were 5.40 for FFP and 5.05 for CPFF and the differences were statistically insignificant. Ethical challenges due to corruption could be linked partially to question 27 relating to “local political pressures”. The mean

responses were 5.00 for FFP and 4.20 for CPFF and the differences were statistically significant, indicating a widely perceived impact based on contract type.

### **Qualitative Responses**

The third section of questionnaire responses asked overarching questions with regards to CPFF and FFP contracts. This was served as the more qualitative portion of the survey that encouraged open-ended responses. The responses to each question were aggregated with a tally and tabulated method of distillation. The comments were analyzed and synthesized through a search for patterns with direct interpretation. Table 19 - Perspective Questions, shows the preferred contract type for four of the eight questions asked and the overarching reasons provided for the selection.

**Table 19 - Perspective Questions**

***From the contractor perspective, which contract type would you prefer to work on?***

<i>Response</i>	<i>Count</i>	<i>Comments</i>
CPFF	17	Risk is on the government. Can be done profitably and with quality if there are realistic expectations and executed in a timely fashion.
FFP	1	None
Neither	1	No difference

***From the perspective of the government, which contract type saves the most money?***

<i>Response</i>	<i>Count</i>	<i>Comments</i>
CPFF	12	In the long-term, costs are lower. Changes will occur on every project. CPFF allows changes with minimal cost impact as long as the decision is made quickly and the contractor isn't paid to sit on site while decisions are being made. Under FFP the contractor will continue until government issues stop work so it can cost more in work stoppage and the loss of money from executed work already in place.
FFP	6	CPFF has large cost overruns in the long-term with claims and rework.
Neither	1	CPFF has lower cost for less defined scopes, conditions, evolving mission. FFP is lower for supply and delivery with well defined scopes.

***From the perspective of the government, which contract type delivers projects faster?***

<i>Response</i>	<i>Count</i>	<i>Comments</i>
CPFF	7	Faster for emerging areas with less defined scopes and conditions, and evolving mission requirements.
FFP	7	FFP has liquidated damages.
Neither	5	Construction takes a set amount of time, or requires trade-offs to accomplish faster regardless of contract type.

***From the perspective of the government, which contract type delivers projects with the best quality?***

<i>Response</i>	<i>Count</i>	<i>Comments</i>
CPFF	14	Government assumes risk so it attracts quality focused contractors where both parties work toward a common goal. FFP encourages lowest cost and tends to provide bare minimum to maximize profit margins.
FFP	0	None
Neither	5	About the same in places like Afghanistan.



The other four questions were completely open-ended responses. The first question asked the respondent to describe how they define project success. Quality end products, on time and within budget were the most frequently stated concepts. Maximizing cultural/mentoring/host nation resources was next, followed by safe and ethically compliant construction, meeting mission requirements, customer satisfaction, and sustainable facilities. Some respondents indicated a steady state relationship within the iron triangle, by stating that in a contingency, time was always the lesser of the three priorities. Quality and cost control seemed to be of the greatest importance to a few of the respondents. Few other respondents stated that completion of the project was the most important.

The second question asked the survey taker to provide their thoughts on how they perceive the government measures success. The largest single response was that the government emphasizes meeting the schedule. The next most common responses related to lowest cost and staying within budget, followed by quality/safety, and completion of the project with minimal changes and bureaucratic hassles. Responses also indicated the importance of mission requirements, customer satisfaction and teamwork with the contractor.

The third question asked for their personal contract type preference for contingency construction. All but two answered with cost plus. The reasons for choosing CPFF were varied. The single most common response was that it reduces the cost impact to both parties when problems arise, which they say is common for these

environments. CPFF provides for the greatest flexibility for change and encourages teamwork and input from all parties involved. A few of the respondents do admit, however, that it does provide more time and generally a guarantee of money for the contractors. They state that it does put the government as the bearer of the greatest risk, and that more change orders are expected to occur than in FFP. However, some believe that the government secures better contractors and better quality end products with CPFF, because better companies are not willing to take the risk in a contingency environment with FFP. The reasons for choosing FFP by one of the survey takers was that if requirements could be better defined up front FFP would provide the best avenue for execution. There is less risk for the government with FFP, and with CPFF contractors often give extremely low bids with the expectation of more change orders to bring their revenues back up later on in the project.

The final open-ended question analyzed asked which contract type they have had the greatest success with in a contingency and why. There were nine responses for CPFF, three responses for FFP, and three responses stating success with both. Many of the explanations were similar to previous questions for CPFF and FFP. However, for CPFF a few indicated that it was also the best value and had the most realistic pricing, and that if there are enough trained and qualified government oversight personnel to assist with problems and changing situations, customer satisfaction could be higher. FFP responses indicated that if the project is focused on product rather than process it can be successful. There was also a potential for greater earnings with FFP. The responses that indicated success with both contract types had little to say, but one stated that the

government paid the contractor less with CPFF, but there were opportunities for greater earnings with FFP. And another indicated that quality is better with CPFF.

### **Questionnaire Discussion**

Of the three main hypotheses tested in this analysis, none could be rejected. Hypothesis one indicated that requirements development in the planning stage was the most influential on FFP success and that the design stage was the most important stage for CPFF contract success. In both instances, it was discovered that the construction stage appeared to be the most influential, but the differences were not statistically significant. In addition, question 8, government requirements definition, appeared to have the least impact on performance in comparison to other internal factors.

Hypothesis two indicated that internal factors were the more influential on project success, regardless of contract type. As discussed in the resulting analysis from the outputs shown in Table 16, the null hypothesis stood and internal factors were found to be statistically more influential than external factors.

Hypothesis three stated that there was no significant difference between contract type and construction success. As discussed in the analysis from Table 15, the null hypothesis was rejected. CPFF projects overall were perceived to perform better than FFP contracts, and the difference was statistically significant.

## **Chapter 5: Conclusion**

### **Responses to Research Questions**

The following questions were posed as the intent of this research:

- 1. How does an agency choose CPFF versus FFP?*
- 2. What risks are associated with CPFF and FFP contracts in Iraq and Afghanistan?*
- 3. What measures of performance are used for Iraq and Afghanistan and should others be considered for use?*
- 4. Does one contract type produce a better product based on available data and/or determined measures of performance?*
- 5. How do those results compare to another market, such as the United States?*

### **Question One**

In response to the first research question, a governmental agency chooses the appropriate contract method based on the nature of the project and a set of organizationally established criteria evaluated by the Contracting Officer. The Contracting Officer bears the responsibility to determine which type is most appropriate based on a number of factors. Prior to solicitation, future work is evaluated against a number of criteria to include: complexity, competition, requirement definition, project length and historical data of similar work (Manuel 2010). Additional information was

provided in the literature review of the FAR and other federal and organizational guidance.

## **Question Two**

The risks associated with CPFF and FFP contracts were studied extensively in the literature review of numerous Government Accountability Office (GAO) Reports on contingency construction, Iraq and Afghanistan reconstruction audits, as well as transcripts from congressional hearings. Data was also collected from commercial overseas construction risk studies. The key findings were that contingency construction, especially in third world countries, was subject to unique, unpredictable, and often unavoidable challenges. A common trend discovered in a GAO meta-analysis of military construction indicated that internal management issues were consistently tied to poor performance without learning the lesson. In terms of military contingencies, many lessons-learned from past conflicts were either ineffectually catalogued or were not passed on at all to military engineering personnel in the following conflict. This hypothesis was tested in the questionnaire portion of the methodology. As discussed in the resulting analysis from the outputs shown in Table 16, the null hypothesis stood and internal factors we found to be statistically more influential than external factors on construction performance. Internal factors were also found to be statistically different for FFP and CPFF contracts. Cost plus contracts were perceived to be influenced the most by internal performance factors.

## **Question Three**

The compilation and evaluation of construction performance measures was the most varied portion of literature review. Cost and schedule data were found to be the

main “hard” performance measures in use by the government. The “soft” quality and safety oriented CCASS ratings were also used. In the literature review and questionnaire responses the iron triangle remained the “gold-standard” for measurement. However, “softer” quality measures and performance influencing factors were also found to be worthy of further analysis. Internal and externally influenced performance indicators in addition to cost, time, and quality were evaluated against each other through a contract type questionnaire. The “soft” performance measures that were perceived to be most influential to contract success are in Table 20.

**Table 20 - Influential Questionnaire Performance Measures**

<i><b>Influential Questionnaire Performance Measures</b></i>					
	<i>FFP</i>	<i>CPFF</i>		<i>FFP</i>	<i>CPFF</i>
<i>Internal Measure</i>	<i>Rank</i>	<i>Rank</i>	<i>External Measure</i>	<i>Rank</i>	<i>Rank</i>
<i>Contractor Efficiency/ Organization</i>	1	1	<i>Subcontractor Workforce</i>	1	1
<i>Trained Government Acquisition Personnel</i>	2	4	<i>Construction Labor</i>	4	2
<i>Trained Government Construction Oversight Personnel</i>	4 - tied	3	<i>External Supply Issues</i>	3	3
<i>Trained CORs</i>	4 - tied	5	<i>Site Location</i>	2	4
<i>User Expectations</i>	6	2			
<i>Internal Supply Issues</i>	3	6			

#### **Question Four and Five**

The evaluation and comparison of Cost Plus Fixed Fee and Firm Fixed Price construction contracts was accomplished throughout this research. Patterns and practices from a contingency environment and the United States were both included in the process. In the analysis of existing AFCEE cost and schedule growth data, the mean response data for FFP in Afghanistan and in the US indicated consistently less percent cost and schedule growth than CPFF projects in Iraq or Afghanistan. Percent schedule growth was shown to be statistically less for FFP in Afghanistan over CPFF. However, the overall data analysis was not able to show any other materially significant differences. In the analysis of the questionnaire responses, there was a consistent perception that CPFF projects outperformed FFP with respect to overall contract success, and those results were statistically significant. In addition, quality influences were the only statistically different results with-in the iron-triangle. Quality was perceived as the most influential factor to contingency contract success and CPFF quality was believed to be more significantly influential on construction success than FFP quality.

The results of this study indicated that there was no statistical difference in terms of cost performance for FFP and CPFF contracts. Neither existing data nor survey results could establish a significant difference. For schedule, FFP performed significantly better than CPFF projects in a contingency. For quality performance, the results of the questionnaire indicated statistically that CPFF contracts provided a better quality product.

In comparing US and contingency FFP data, the only reliable measure available to test in this research was percent cost growth. The US mean was slightly better, but difference between the means was not statistically significant.

### **Limitations and Future Research**

As is the case with any research endeavor, certain limitations could not be avoided in the execution of data compilation and analysis. The gathering of existing project performance data from projects can prove difficult to obtain when attempting to study subjects that are still ongoing, at a high pace, in a sensitive environment. In addition, some information is not possible to obtain from a distance when it involves hundreds of files to be refined for a mass analysis. For this reason, only a small number of US construction project data files could be sent to cull and analyze. The sum of these limitations in gathering available data narrowed the existing project performance criteria down to a cost and schedule growth analysis.

Within the available data files there were entry errors, missing or incomplete data, and information that was extraneous to the analysis. Information from multiple sheets and sources had to be gathered on the same date, since they were all actively in use, and built into a useable project file. For this reason, many of the oldest project files were discarded. Because FFP contracts have only been awarded in Afghanistan since the start of 2009, there was a smaller proportion of FFP data.

The questionnaire results were also non-ideal due to the small sample size and small population base from which to draw responses. If a larger sample size could have been gathered, the chance of achieving significant results for the comparisons may have



improved. In addition, the demographics from the survey had almost no representation of Quality Assurance/Quality Control, Site Superintendents, and Project Engineers. The majority of responses came from Program/Project Managers, and Contract Management Personnel. This might have influenced the kind of performance results and feedback provided on performance factors.

Several opportunities for future research are available to continue study on this topic. Since FFP project performance data for Afghanistan was minimal at this stage, it may be beneficial to re-evaluate with an even larger pool of FFP and CPFF contracts in a few years from now. Analysis over a longer time period could result in more statistically significant results.

Finally, CCASS data could be gathered for the already evaluated construction projects at any time to compare actual “soft” contract measures against “hard” project cost and time performance. The result may be able to show correlations between quality measurements and perceived quality performance from the questionnaire.

## **Conclusion**

The findings of this research indicated there was no proven advantage in either contract type for cost performance. FFP projects showed to control schedule growth significantly better than CPFF. CPFF contracts indicated a better quality product. The additional results of this study identified that understanding project performance in a contingency environment involves a balance of numerous variables. Contract types influence more than just how a contract is managed. Construction contracts impact the organizational structures required for government and contract personnel, relationships

and teamwork, risk impacts to internal and external influencing factors, and even the definition of project goals and success.

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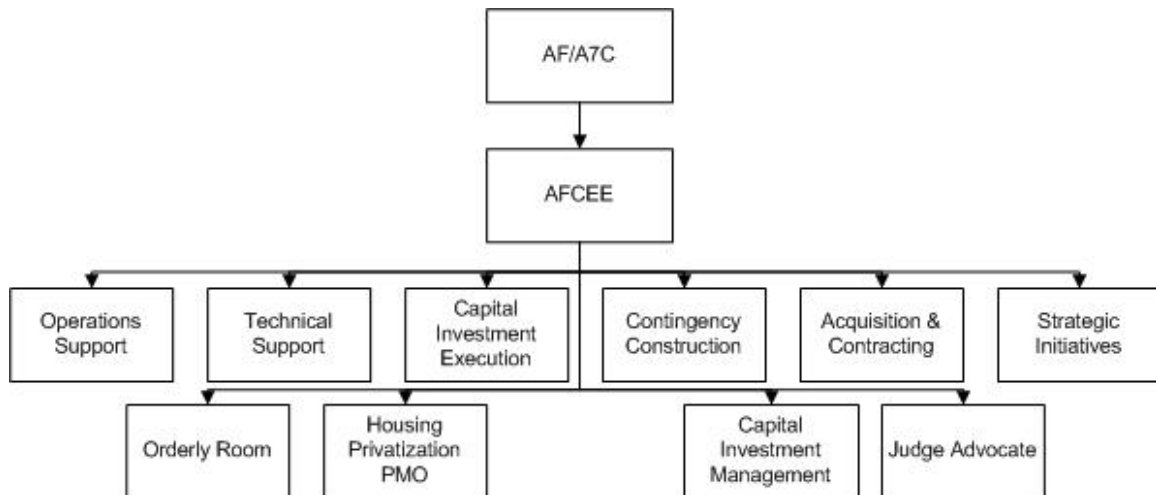
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## Appendix A: Organizational Structures

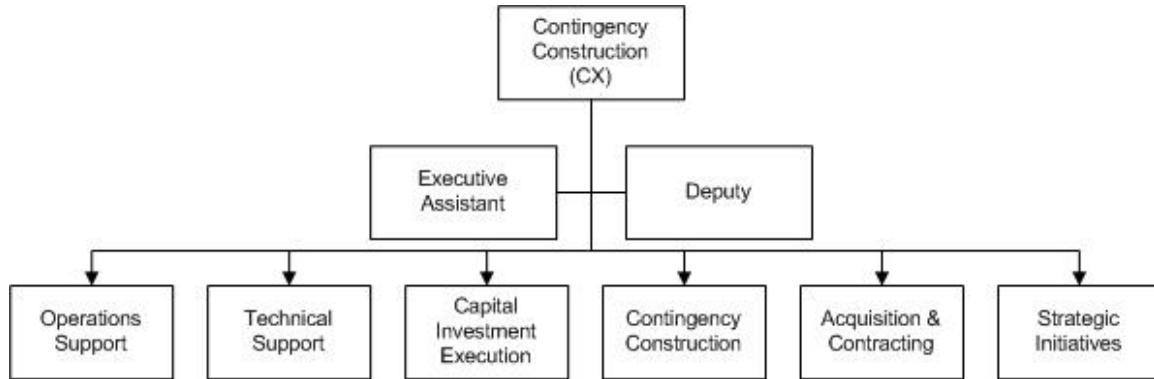
### AFCEE Structure



**Figure 6 - AFCEE Structure (Mayo 2010)**

Figure 11 - AFCEE Structure shows the organizational structure for the whole of AFCEE. Several support elements within this structure provide key aspects of the Contingency Construction Division effort. The Acquisition and Contracting Support Division (AC), provides dedicated contracting services for AFCEE including CX. The Operations Support Division (OS) houses the Financial Management (OSF) function for AFCEE. They provide budgetary support to include formulation, justification and execution of financial documents, as well as other key budgetary and processing capabilities (Mayo 2010).

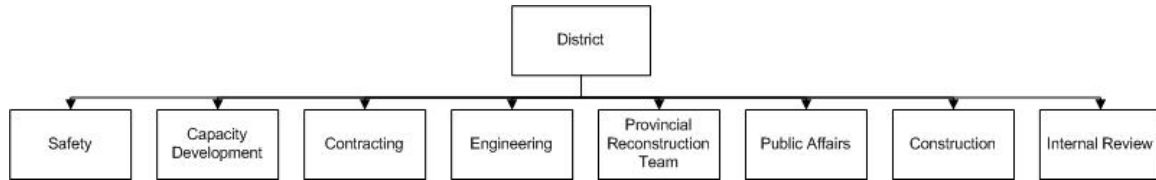
## AFCEE/CX Structure



**Figure 7 - CX Division (Mayo 2010)**

Figure 2 shows the CX Division organizational hierarchy. The division chief and executive staff oversees the all aspects of their construction projects. The MILCON/Minor Construction (CXM) element is responsible for installation and facility construction directly used by U.S. military in the AOR. The Security Transition (CXT) element is charged with construction projects that improve Iraqi and Afghan government facilities and infrastructure. The Support (CXS) element is responsible for the oversight and contracts for technical assistants, basic design and master planning service personnel (Title I), quality assurance oversight personnel (Title II), and Architectural-Engineering design services that make the AFCEE mission and model of construction run. The Programs (CXP) element acts as an “owner’s agent for the Commander of the Air Force Forces (COMMAFFOR) for any large scale construction executed by USACE or the Naval Facilities Engineering Command (NAVFAC). Finally, the Deployed (AFCEE-A or CXA) element performs as the Contracting Officer Representative (COR) and Project Manager in the AOR; a liaison between AFCEE-SA and the customer (Mayo 2010).

## USACE District Structure



**Figure 8 - District Structure (AED-N 2010)**

Figure 13 - District Structure shows the organizational hierarchy for USACE districts in Iraq and Afghanistan. The district is a largely self-sufficient organism. They have a fully functional contracting branch, with multiple contracting officers in place. Also, the district has a small engineering function, capable of providing some minimal design guidance and oversight. The construction branch oversees the execution of construction projects; provide QA and COR support. They contain a safety branch, capacity development, public affairs, and internal review functions.

## Appendix B: Cost Plus Versus Firm Fixed Questionnaire

The purpose of this survey is to determine the extent different performance factors influence the outcome of Firm Fixed Price(FFP) and Cost Plus Fixed Fee(CPFF) construction projects in Iraq and Afghanistan. The outcome of this survey may contribute to decisions concerning future wartime contingency construction contracts. Please answer questions based on your experiences.

Firm Fixed Price - "A firm-fixed-price contract provides for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract" (FAR 16.202-1).

Cost Plus Fixed Fee - "A cost-plus-fixed-fee contract is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract" (FAR 16.306).

Instructions: Please rate the following influencing factors based on your past experience with Firm Fixed Price and Cost Plus Fixed Fee Projects in Iraq and Afghanistan. Give a relative weight to each factor based on how much each has impacted contract success the most. The focus of your response should be on how well you think each contract type was able to perform under a given circumstance and/or project stage. The survey is broken up into 4 short sections relating to the following topics: the overall performance of each contract type during each stage of project execution, the impact of specific internal factors, the impact of specific external factors, and your personal thoughts on each contract type.

If at the end of any section you believe an important factor was not included or if you have any additional comments that need to be addressed, there will be opportunity to provide additional feedback at the end of the sections.

Part 1: On a scale of 1 to 7, with 1 being least influential and 7 being most influential, rate how much cost, time and quality factors for each contract type are affected during each stage of the construction process.

**1. How influential is the execution of the Initial Planning and Estimating Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Least Influential	2	3	4	5	6	Most Influential
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							
Comment	<div></div>						

**2. How influential is the execution of the Design Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Least Influential	2	3	4	5	6	Most Influential
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							
Comment	<div></div>						

**3. How influential is the execution of the Construction Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Least Influential	2	3	4	5	6	Most Influential
--	-------------------	---	---	---	---	---	------------------

CPFF Time				
CPFF Cost				
CPFF Quality				
FFP Time				
FFP Cost				
FFP Quality				
Comment				

**4. How influential is the execution of the Red Zone and Turnover Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Least Influential	2	3	4	5	6	Most Influential
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							
Comment							

**5. How influential is Contract Type on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Least Influential	2	3	4	5	6	Most Influential
CPFF Time							



CPFF Cost					
CPFF Quality					
FFP Time					
FFP Cost					
FFP Quality					
Comment					

**6. How well do CPFF and FFP projects Perform Overall in terms of time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)**

	Very Poor	2	3	4	5	6	Very Well
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							
Comment							

**7. How well do projects meet the User's Design and Operational Expecations? (Does End State Use = User Intent?)**

	Very Poor	2	3	4	5	6	Very Well
Cost Plus							
FFP							
Comment							

Part 2: On a scale of 1 to 7, with 1 being least affected and 7 being most affected, rate how much each Internal Factor affects overall project success for each contract type.

Internal factors are persons, places or things that are within your organization's realm of influence. Factors may include: organizational processes and support structures, employees, quality of deliverables, etc.

8. How well are the Government Directed Design and Construction Requirements defined?

	Very Poor	2	3	4	5	6	Very Well
Cost Plus							
FFP							
Comment							

9. How difficult is it to meet the Government's Standards and Requirements in a contract in the Design Phase?

	Least Difficult	2	3	4	5	6	Most Difficult
Cost Plus							
FFP							
Comment							

10. How difficult is it to meet the Government's Standards and Requirements in a contract in the Construction Phase?

	Least Difficult	2	3	4	5	6	Most Difficult
Cost Plus							

Cost Plus

FFP

Comment

--

**11. How influential are Strategic Contract Acquisition and Management Decisions on the success of a contract?**

**(Decisions would likely be made by Senior Military/Civilian Leaders and include: Project Prioritization, Site Selection, Payment Methods, Project Scope and Personnel Requirements.)**

	Least Influential	2	3	4	5	6	Most Influential
Cost Plus							
FFP							
Comment							

--

**12. How influential are the Number and Availability of Trained Acquisition Personnel on the success of a contract?**

**(Personnel would likely perform tasks such as: change order approvals, payment processing, etc.)**

	Least Influential	2	3	4	5	6	Most Influential
Cost Plus							
FFP							
Comment							

--

**13. How influential are the Number and Availability of Trained Construction Oversight Personnel on the success of a contract?**

**(Personnel would likely perform tasks such as: submittal reviews, quality assurance, on-site presence)**

	Least Influential	2	3	4	5	6	Most Influential
Cost Plus							
FFP							
Comment							

**14. How influential are the Number and Availability of Trained Contracting Officer Representative Personnel on the success of a contract?**

**(Personnel would likely perform tasks such as: submittal reviews, project management, quality assurance, on-site presence)**

	Least Influential	2	3	4	5	6	Most Influential
Cost Plus							
FFP							
Comment							

**15. How influential is the Prime Contractor's Adequacy and Efficiency of Organization on the success of a contract?**

**(Personnel would likely perform tasks such as: reachback support and highly-trained on-site management and leadership)**

	Least Influential	2	3	4	5	6	Most Influential
Cost Plus							
FFP							
Comment							

**16. To what degree do Security Incidents from Internal Causes impact the success of a contract?**

**(ie: poor security planning, incompetent workforce)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**17. To what degree do Internal Supply Issues impact the success of a contract?**

**(ie: customer continually rejects part submittals)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**18. To what degree do Construction Accidents/Safety Violations impact the success of a contract?**

**(ie: poor scaffolding, falls, improper PPE)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**19. To what degree are Warranty Calls the result of Internal Project Problems?**

**(ie: the source of the problem is poor specifications, poor construction techniques, etc.)**

	Least	2	3	4	5	6	Most
--	-------	---	---	---	---	---	------

Cost Plus

FFP

Comment

**20. To what degree do Internal Factors (organizational persons and processes you can influence) affect the outcome of contracts?**

	Least	2	3	4	5	6	Most
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							

Comment

Part 3: On a scale of 1 to 7, with 1 being least affected and 7 being most affected, rate how much each External Factor affects overall project success for each contract type.

External Factors are persons, places or things that are outside of your realm of influence. Such factors include: weather, terrorists, economic conditions, and other environmental factors outside of your organization's control.

**21. To what degree do External Supply Issues impact the success of a contract?  
(ie: backordered parts, supply route diverted)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							

Comment

--

**22. To what degree does the Quality of the Construction Labor Workforce impact the success of a contract?**

**(ie: Unskilled Labor/Sabotage/Absent)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							

Comment

--

**23. To what degree does the Quality of the Subcontractor Workforce impact the success of a contract?**

**(ie: Unskilled Labor/Sabotage/Absent)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							

Comment

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**24. To what degree do Security Incidents from External Causes impact the success of a contract?**

**(ie: Terrorist activity)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							

Comment

**25. To what degree do Unforeseen Site Conditions impact the success of a contract?**  
**(ie: UXOs, soil characteristics)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**26. To what degree does the Site Location impact the success of a contract?**  
**(ie: Remote, Access difficult, Few Laborers, High Traffic, etc.)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**27. To what degree do Local Political Pressures impact the success of a contract?**  
**(ie: extortion/land ownership disputes)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**28. To what degree do Local Economic Factors impact the success of a contract?**



**(ie: inflation, high demand & few assets)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**29. To what degree are Warranty Calls the result of external causes?**

**(ie: no regular maintenance, poor maintenance techniques, improper use of facility, etc.)**

	Least	2	3	4	5	6	Most
Cost Plus							
FFP							
Comment							

**30. To what degree do External Factors (persons and processes outside of reasonable control) affect the outcome of contracts?**

	Least	2	3	4	5	6	Most
CPFF Time							
CPFF Cost							
CPFF Quality							
FFP Time							
FFP Cost							
FFP Quality							
Comment							

**31. Other Factors (OPTIONAL: write-in any additional influencing factors that should be considered and rank their overall impact to construction success below)**

	Least Impact	2	3	4	5	6	Most Impact
Factor 1 - CPFF							
Factor 1 - FFP							
Factor 2 - CPFF							
Factor 2 - FFP							
Factors							

Part 4: This section is an open comment section to provide your thoughts on successful contracts and important benefits and drawbacks of each contract type. Your feedback in this section is very important for drawing conclusions from this study and developing possible solutions for future contract improvements.

**32. From your personal point of view, how do you define project success based on what you've experienced in Iraq and/or Afghanistan?**

**33. From your personal point of view and experience, how do you think the government defines project success in Iraq and Afghanistan?**

**34. In your experience do you have a preference for one of the contracting methods used? What do you view as the primary benefit(s) of that execution avenue?**

**35. Which contract method have you had greater success with? Why do you think that is?**

**36. From the contractor perspective, which contract type would you prefer to work on?**

- ☐ Cost Plus
- ☐ FFP
- ☐ Neither

Comment

**37. From the perspective of the government, which contract type saves the most money?**

- ☐ Cost Plus
- ☐ FFP
- ☐ Neither

Comment

**38. From the perspective of the government, which contract type delivers projects faster?**

- ☐ Cost Plus
- ☐ FFP
- ☐ Neither

Comment

**39. From the perspective of the government, which contract type delivers projects with the best quality?**

- ☐ Cost Plus
- ☐ FFP
- ☐ Neither

Comment

Demographics

**40. What is your age?**

**41. What is the highest level of school you have completed or the highest degree you have received?**

- ☐ Less than high school degree
- ☐ High school degree or equivalent (e.g., GED)
- ☐ Some college but no degree
- ☐ Associate degree
- ☐ Bachelor degree
- ☐ Graduate degree

**42. How many years have you been in the construction industry?**

**43. How many years have you done construction in Iraq and/or Afghanistan?**

**44. What best describes your current occupational position?**

- ☐ Quality Assurance or Quality Control
- ☐ Site Superintendent
- ☐ Construction or Project Manager
- ☐ Contract Officer or Representative
- ☐ Program Manager
- ☐ Project Engineer
- ☐ End User or Project Leadership

Other (please specify)

**45. What other positions have you held in Iraq or Afghanistan?**

**(Select all that apply)**

- ☐ Quality Assurance or Quality Control
- ☐ Site Superintendent
- ☐ Construction or Project Manager
- ☐ Contract Officer or Representative
- ☐ Program Manager
- ☐ Project Engineer
- ☐ End User or Project Leadership

Other (please specify)

Done

## Appendix C: JMP Data and Analysis Outputs

Table 21 - Sample AFCFE Acquisition Timeline Metric Data

Task Order	Mod	Total IGE	Initial SOR Date	Adj SOR Date	Date to Contracting	Date RFP Issued	Date Proposal Due	Date TE to Contracting	Est. Award Date	Award Date
0012	0	\$70,206,757.00	3/31/2008		3/31/2008	6/12/2008	7/2/2008	7/11/2008	9/19/2008	9/11/2008
0013	0	\$11,616,190.00	4/23/2008		4/23/2008	5/13/2008	8/20/2008	8/21/2008	9/15/2008	9/12/2008
0011	0	\$14,660,344.00	7/3/2009		3/22/2010	3/26/2010	4/16/2010	4/19/2010	6/9/2010	6/8/2010
0012	0	\$22,196.00	5/4/2010			3/9/2010	5/7/2010	5/10/2010	5/31/2010	5/18/2010
0011	0	\$14,660,344.00	8/20/2009		3/22/2010	3/26/2010	4/16/2010	4/19/2010	6/9/2010	6/8/2010
0010	0	\$15,096,405.00	4/1/2008		4/1/2008	5/5/2008	5/28/2008	6/11/2008	7/13/2008	7/2/2008
0012	0	\$16,985,697.00	4/7/2008		4/7/2008	5/13/2008	6/3/2008	6/16/2008	7/18/2008	7/16/2008
0014	0	\$22,961,889.00	3/24/2008		3/24/2008	6/4/2008	6/24/2008	7/1/2008	9/19/2008	8/29/2008
0017	0	\$13,966,783.00	11/18/2008	1/12/2009	11/18/2008	2/9/2009	3/9/2009	3/31/2009	5/15/2009	5/13/2009

Table 22 - Sample AFCEE Cost and Schedule Growth Data

Contract #	TO	Title	Original TO \$	Current TO \$	\$ Growth	% Cost Growth	Awarded	Initial PoP End	Current PoP End
FA8903-06-D-8505	2	MOI Criminal Investigation I	4235350	4165598.3	-69751.75	-0.0164	3/8/07	7/10/07	4/30/08
FA8903-06-D-8506	2	207th ANA Commando Kane	9706144	12643153	2937009	0.3025	9/24/09	11/23/10	4/28/11
FA8903-06-D-8513	2	Construction Services in Sup	29835528	32239172	2403644	0.0805	10/19/06	8/23/07	12/15/08
FA8903-06-D-8505	3	National Command & Contr	1821915	2920893	1098978	0.6031	3/27/07	3/31/08	1/27/08
FA8903-06-D-8506	3	Construction of FOB Kandak	14980754	14980754	0	0	9/28/09	3/29/10	12/30/10
FA8903-06-D-8512	3	Construct Iraqi AF and Fligh	21280964	8580964	-12700000	-0.5967	6/15/07	2/10/08	2/10/08
FA8903-06-D-8505	4	Construct & Renovate Sama	6949432	6876692	-72740	-0.0104	9/27/07	5/28/08	2/17/08
FA8903-06-D-8506	4	Repair Runway 18/36, Shinc	34249622	38748119	4498497	0.1313	3/26/10	2/15/11	2/26/11
FA8903-06-D-8509	4	Construction to Support the	6896935	6527165.1	-369769.9	-0.0536	4/24/07	9/30/07	5/31/08
FA8903-06-D-8510	4	Facilities for 4th BDE of 9th U	31804561	31761379	-43182.24	-0.0013	3/29/07	11/25/07	9/28/08
FA8903-06-D-8521	4	Construct the Navy SE at Un	14988526	15163752	175226	0.0116	2/1/07	12/10/07	7/31/08
FA8903-06-D-8504	5	Facilities for the 11th DIV HC	5038726	9922127	4883401	0.9691	12/29/06	6/30/07	7/23/07
FA8903-06-D-8505	5	Vehicle Repair Facilities for I	10268243	402159.64	-9866083	-0.9608	9/30/07	9/26/08	2/15/08
FA8903-06-D-8507	5	Kabul Military Training Cent	37631248	40857595	3226347	0.0857	11/8/06	3/11/08	8/31/09
FA8903-06-D-8510	5	Construct Facilities for the 1	28831963	28776593	-55369.53	-0.0019	5/22/07	3/31/08	8/31/08
FA8903-06-D-8507	6	Kabul Military Training Cent	19590497	28108433	8517936	0.4347	3/2/07	1/24/08	1/9/10

Table 23 - Sample AFCEE Cost and Schedule Growth Data Cont.

Initial Days	Additional Days	% Sched Growth	WCR \$'s	CTC \$'s	> 5% Cost Growth	> 5% Sched Growth	Countr Y	FY	% Comple	Contract Type
124	295	2.379	-69751.75	0	N	Y	Iraq	2007	0.99	CPFF
425	156	0.3671	2937009	0	Y	Y	Afghan	2009	0.82	CPFF
308	480	1.5584	2403644	0	Y	Y	Afghan	2007	0.99	CPFF
370	-64	-0.173	1098978	0	Y	N	Iraq	2007	0.99	CPFF
182	276	1.5165	0	0	N	Y	Afghan	2009	0.53	CPFF
240	0	0	-10200000	-2500000	N	N	Iraq	2007	0.05	CPFF
244	-101	-0.4139	-72740	0	N	N	Iraq	2007	0.99	CPFF
326	11	0.0337	4498497	0	Y	N	Afghan	2010	0.95	CPFF
159	244	1.5346	-70000	-299769.9	N	Y	Iraq	2007	0.99	CPFF
241	308	1.278	-43182.24	0	N	Y	Iraq	2007	0.99	CPFF
312	234	0.75	130435	44791	N	Y	Iraq	2007	0.99	CPFF
183	23	0.1257	1518175	3365226	Y	Y	Iraq	2007	0.99	CPFF
362	-224	-0.6188	-9866083	0	N	N	Iraq	2007	0.02	CPFF
489	538	1.1002	1752871	1473476	Y	Y	Afghan	2007	0.99	CPFF
314	153	0.4873	-55369.53	0	N	Y	Iraq	2007	0.96	CPFF
328	716	2.1829	6365413	2152523	Y	Y	Afghan	2007	0.99	CPFF



## Appendix D: Survey Data and Analysis

Table 24 - Survey Data

How influential is the execution of the Initial Planning and Estimating Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)						How influential is the execution of the Design Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)					
CPFF Time	CPFF Cost	CPFF Quality	FFP Time	FFP Cost	FFP Quality	2CPFF Time	2CPFF Cost	2CPFF Quality	2FFP Time	2FFP Cost	2FFP Quality
6	6	4	6	6	5	6	7	5	6	7	5
3	4	2	7	6	5	3	4	2	7	6	5
4	4	4	7	7	7	4	4	4	6	6	6
6	6	5	7	7	5	4	6	7	4	6	7
6	4	7	3	5	1	7	1	6	4	3	5
7	5	5	7	5	5	7	7	5	7	7	5
4	4	1	4	4	7	3	3	1	7	7	1
3	6	6	6	5	3	3	5	5	6	6	3
6	6	6	2	2	4	6	6	6	2	2	3
7	5	3	7	6	5	7	6	5	7	6	5
5	7	2	7	6	2	5	7	4	7	6	4
7	4	2	7	6	2	6	4	2	7	6	2
4	2	6	6	6	5	5	7	6	5	7	6
6	6	6	4	4	4	6	6	6	4	4	4
5	3	2	7	6	2	5	4	1	7	6	1
6	6	5	7	6	5	4	5	4	5	6	5
3	2	2	4	6	5	3	4	4	5	7	7
0.186											
7	7	7	7	7	7	7	7	7	7	7	7
7	7	7	7	7	7	7	7	7	7	7	7

How influential is the execution of the Construction Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)						How influential is the execution of the Red Zone and Turnover Stage on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)					
3CPFF Time	3CPFF Cost	3CPFF Quality	3FFP Time	3FFP Cost	3FFP Quality	4CPFF Time	4CPFF Cost	4CPFF Quality	4FFP Time	4FFP Cost	4FFP Quality
6	7	7	6	7	7	6	6	5	6	6	5
7	6	5	4	3	2	6	7	5	4	3	2
4	4	4	7	7	7	4	4	4	4	4	4
7	7	7	7	7	7	6	6	6	6	6	6
7	4	5	3	6	1	5	1	7	4	3	5
7	7	7	7	7	7	5	5	4	5	5	4
6	6	7	6	6	2	1	1	1	1	1	2
3	3	4	6	6	3	3	4	5	6	6	3
6	6	6	3	3	4	6	6	6	3	3	4
7	5	5	7	4	4	7	4	5	7	4	5
3	6	7	4	6	7	3	6	7	4	6	7
5	6	3	7	7	2	3	4	2	4	4	2
2	3	6	7	7	5	6	4	5	7	3	5
6	6	6	5	5	5	6	6	6	4	4	4
5	3	4	7	6	5	1	1	1	1	1	1
6	6	6	6	6	6	3	2	2	5	2	2
5	5	5	7	7	7	6	6	6	7	7	7
						7	7	7	7	7	7
7	7	7	7	7	7	6	6	6	6	6	6
7	7	7	7	6	7	5	5	7	5	5	7

How influential is Contract Type on overall project success with respect to time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)						How well do CPFF and FFP projects Perform Overall in terms of time, cost, and quality? (Assuming short timeframes, low costs, and high quality are desired)					
5CPFF Time	5CPFF Cost	5CPFF Quality	5FFP Time	5FFP Cost	5FFP Quality	6CPFF Time	6CPFF Cost	6CPFF Quality	6FFP Time	6FFP Cost	6FFP Quality
7	7	5	7	7	5	7	5	6	5	4	5
1	2	5	6	7	3	2	1	5	6	7	4
5	5	5	5	5	5	1	1	7	7	7	7
4	4	3	7	7	3	4	5	6	5	4	4
7	5	3	4	6	1	7	4	6	6	3	6
7	7	7	3	3	3	7	7	7	4	4	4
7	7	6	1	1	1	5	5	7	3	3	1
3	5	5	6	6	3	3	5	5	6	6	3
5	5	5	5	3	4	4	6	6	3	3	4
7	6	6	7	5	4	7	7	7	6	1	4
2	6	7	5	7	2	4	4	6	4	5	4
3	6	2	7	7	2	3	7	5	6	4	2
2	1	1	1	1	1	1	4		2	2	4
6	6	6	4	4	4	6	6	6	3	3	3
5	4	3	7	6	2	3	5	7	4	3	1
5	5	4	7	7	4	6	6	6	6	6	4
5	4	5	7	7	7	4	5	6	6	7	6
7	7	7	4	4	4	7	7	7	7	1	1
5	5	7	6	5	5	5	5	7	6	6	4
7	7	7	6	6	6	5	5	7	6	5	4

How influential are the Number and Availability of Trained Construction Oversight Personnel on the success of a contract? (Personnel would likely perform tasks such as: submittal 13Cost Plus 13FFP	How influential are the Number and Availability of Trained Contracting Officer Representative Personnel on the success of a contract? (Personnel would likely perform tasks such as: 14Cost Plus 14FFP	How influential is the Prime Contractor's Adequacy and Efficiency of Organization on the success of a contract? (Personnel would likely perform tasks such as: 15FFP 15Cost Plus	To what degree do Security Incidents from Internal Causes impact the success of a contract? (ie: poor security planning, incompetent workforce) 16FFP 16Cost Plus	To what degree do Internal Supply Issues impact the success of a contract? (ie: customer continually rejects part submittals) 17FFP 17Cost Plus	To what degree do Construction Accidents/Safety Violations impact the success of a contract? (ie: poor scaffolding, falls, improper PPE) 18FFP 18Cost Plus
6	6	7	6	5	4
6	2	6	2	6	4
5	7	7	7	5	2
5	7	6	3	6	7
4	5	4	6	5	7
7	7	7	3	5	3
3	3	1	7	3	2
3	6	6	3	3	3
6	4	5	4	4	6
5	7	7	6	6	
6	7	5	6	7	
6	7	6	7	5	7
7	6	7	7	6	2
5	3	3	5	7	2
5	3	4	5	4	4
4	6	6	6	6	4
6	5	7	3	6	2
5	7	7	6	7	1
7	2	2	2	6	1
6	7	7	2	6	6

To what degree are Warranty Calls the result of Internal Project Problems? (ie: the source of the problem is poor specifications, poor construction techniques, etc.)		To what degree do Internal Factors (organizational persons and processes you can influence) affect the outcome of contracts?						To what degree do External Supply Issues impact the success of a contract?		To what degree does the Quality of the Construction Labor Workforce impact the success of a contract? (ie: Unskilled Labor/Sabotage/Absent)	
19FFP	19Cost Plus	20CPFF Time	20CPFF Cost	20CPFF Quality	20FFP Time	20FFP Cost	20FFP Quality	21FFP	21Cost Plus	22FFP	22Cost Plus
5	1	6	6	6	6	6	6	7	3	5	5
2	2	6	7	3	2	2	2	6	6	2	6
5	5	5	5	5	5	5	5	6	6	6	4
4	4	5	5	5	5	5	5	2	2	6	6
4	4	7	3	5	6	1	4	4	4	3	3
2	2	6	6	6	6	6	6	4	4	6	6
7	1	7	7	7	6	6	6	3	3	1	7
3	6	6	6	6	3	3	3	3	6	3	6
6	4	6	6	6	4	4	4	6	6	7	7
								3	3	7	7
2	4	5	6	7	6	7	5	7	5	7	7
6	6	5	4	7	6	4	7	6	4	7	5
2	2	5	5	5	6	6	6	7	6	7	6
4	4	4	4	4	4	4	4	5	4	4	4
3	2	4	4	4	4	4	4	7	6	6	5
2	2	6	4	6	6	4	6	6	5	6	6
6	6	4	4	4	7	7	7	7	7	2	2
7	7	7	7	7	7	7	7	7	7		
2	2	6	6	6	6	6	6	7	7	7	7
7	7	7	7	7	7	7	7	6	6	7	7

To what degree does the Quality of the Subcontractor Workforce impact the success of a contract? (ie: Unskilled Labor/Sabotage/Absent)		To what degree do Security Incidents from External Causes impact the success of a contract? (ie: Terrorist activity)		To what degree do Unforeseen Site Conditions impact the success of a contract? (ie: UXOs, soil characteristics)		To what degree does the Site Location impact the success of a contract? (ie: Remote, Access difficult, Few Laborers, High Traffic, etc.)		To what degree do Local Political Pressures impact the success of a contract? (ie: extortion/land ownership disputes)		To what degree do Local Economic Factors impact the success of a contract? (ie: inflation, high demand & few assets)	
23FFP	23Cost Plus	24FFP	24Cost Plus	25FFP	25Cost Plus	26FFP	26Cost Plus	27FFP	27Cost Plus	28FFP	28Cost Plus
5	5	7	2	7	4	7	3	5	5	5	5
6	6	3	1	4	2	4	5	3	3	1	1
6	4	7	7	5	3	6	3	5	3	5	3
6	6	3	3	7	7	7	7	4	4	4	4
4	5	5	5	3	4	5	5	4	3	4	4
6	6	5	5	7	7	6	6	5	5	4	4
1	7	3	3			3	3	3	3	3	3
3	6	5	6	3	6	5	6	6	4	6	4
7	7	4	4	5	5	6	6	7	7	6	6
7	7	2	2	2	3	2	3	2	3	2	3
7	7	7	6	6	5	7	5	7	6	7	5
6	4	5	3	3	1	7	6	4	2	3	2
7	6	4	5	6	4	6	5	4	4	4	4
4	4	4	4	4	4	4	5	4	4	5	3
6	5	3	2	3	2	3	2	5	5	3	3
6	6	5	4	6	4	6	6	6	5		
6	6	7	7	6	1	7	2	7	2	6	2
7	7	7	7	7	7	7	7	7	7	7	7
7	7	6	6	6	6	6	6	5	2	6	2
7	7	6	6	5	5	7	7	7	7	7	7

To what degree are Warranty Calls the result of external causes? (ie: no regular maintenance, poor maintenance techniques, improper use of facility, etc.)	29FFP	29Cost Plus	To what degree do External Factors (persons and processes outside of reasonable control) affect the outcome of contracts?							
			30CPFF Time	30CPFF Cost	30CPFF Quality	30FFP Time	30FFP Cost	30FFP Quality		
	7	1	3	3	3	6	6	3		
	2	2	4	6	2	5	2	2		
	5	3	3	3	3	5	5	5		
	6	6	4	4	4	4	4	4		
	6	6	6	4	1	7	5	2		
	4	4	5	5	3	5	5	3		
	3	3	3	3	3	3	3	3		
	3	6	3	3	3	6	5	3		
	6	6	7	7	7	7	7	7		
	4	4	4	4	4	5	5	5		
	7	7	5	7	4	5	7	3		
	5	5	1	1	1	2	2	1		
	4	4	4	4	4	5	5	5		
	4	3	4	4	4	5	5	5		
	7	7	2	2	2	2	2	2		
	5	4	5	5	5	5	5	5		
	7	7	6	7	6	7	7	7		
	7	7	7	7	7	7	7	7		
	6	2	3	3	3	6	6	6		
	2	2	3	3	3	3	3	3		

Other Factors (OPTIONAL: write-in any additional influencing factors that should be considered and rank their overall impact to construction success below)				
Factor 1 - CPFF	Factor 1 - FFP	Factor 2 - CPFF	Factor 2 - FFP	Factors
1	3	6	1	6
2				
3				
4				
5				
6				I would suggest you only use CPFF to perform construction successfully in a war zone such as Afghanistan
7	7	1	7	1
8	3	3	5	5 1) Best value 2) Long term sustainability
9	6	6	6	6
10				Lack of awareness of operating theatre difficulties Same We do not seem to learn by experience but we seem to shred all information and start again next time around Same
11	5	6		
12				
13				
14	4	4	4	4
15				
16				
17	5	7	5	7
18				
19				
20				1. Lack of trained Govt COR personnel with no clue of construction in a Contingency Env. and not trained in risk mgt associated with FFP vs Cost + contracts. 2. Constant turnover of CORs. and their lack of construction experience 2.



32. From your personal point of view, how do you define project success based on what you've experienced in Iraq and/or Afghanistan?  
Open-Ended Response

Delivery of constructed quality-appropriate facilities to mission requirements on a timely, cost-effective, safe and ethically compliant basis in a manner that supports sustainable profitability for the contractor, safe and productive growth for the participants, healthy cultural and mentoring interactions with host nation resources and customer satisfaction.

Project success is working with the government to jointly overcome obstacles to meeting or exceeding mission objectives

ON time, On budget, no serious incidents, and AFCEE client satisfaction.  
Overall client satisfaction  
The quality and time to finish the project on schedule.  
Site selection, planning, planning, planning

A successful project is one built within budget and quality targets with minimal schedule delays that achieves the objective of the organization responsible for execution (CSTC-A or USFOR-A for example).

A typical "canned" answer is on time, under budget and done with no accidents. I define success in this AOR by the following: 1) no accidents while imparting a safety culture to a work force with no previous safety history; 2) provide quality and sustainable facilities; 3) meet project budget; 4) help the local subcontractors be successful and make money. Good contractors in order to be successful need to be profitable. Mentoring and helping them is key to leaving a sustainable construction industry. If you do these things you will have satisfied customers and end users. I left off schedule on purpose. Schedule is always important, but in this AOR I have only once achieved all three milestones (cost, schedule and quality). I focus on delivering quality facilities within cost. In a contingency environment with major security issues, unskilled workforce, unpredictable Host nation government and most materials being shipped in from out of country, meeting a prescribed FPOP in a RFP has had a low probability of being met. I would rather be late than provide facilities that are substandard and have legacy maintenance issues.

a signed 1354

Delivering a complet and usable project that is maintainable with local resources

It depends on project location in the country. On ISAF facilities - on or under budget, on or ahead of schedule, meeting or exceeding quality expectations Remote locations - completing the project on budget while meeting or exceeding quality expectations

Providing a quality, durable product in a timely fashion. There will be multiple delays/extensions on most projects. If the delays can be minimized and the site turned over without impacting the end user, the project is successful.

1. Completing the project on time and within budget = #1 success factor 2. Ability to sit down and talk through issues as a team, rather than the Govt always being suspicious that the HERC is trying to get something "over" on the COR. This is extremely frustrating. It seems tht all teaming and partnering has gone by the way side over the past 2 years. 3. Ability to get bona fide changes through the system. This process is broken and needs fixing.

If the project is completed and meets all the requirements of a project the same as I would do in the US in the private sector then it is a success. I have done is repeatedly in Iraq

Completion of project with good quality in a reasonable period of time generally within budget with minimal accidents.

33. From your personal point of view and experience, how do you think the government defines project success in Iraq and Afghanistan?

Open-Ended Response

1 Predictable project delivery to customer mission requirements at the lowest cost.

the government has gotten away from a team approach that served AFCEE so well in the past and

2 now seek to blame contractors rather than work with them

3

4

5

6 same as 32

7 Best value, minimizing costs associated with long term sustainability.

8 The time to finish the project on schedule.

Completion of build to operational readiness and it should be - the security forces need these facilities

9 if we are to move forward as without security none of the other nice NGO projects will succeed

10 A project that meets budget, quality and schedule targets and as few changes as possible.

11 Meet Schedule, Quality and Cost metrics.

12 a signed 1354

13 Project complete

14

It may sound harsh but I believe that many Government representatives simply define success as

15 completion.

Lowest cost at award appears to be the government's definition of success. It does not take into

16 consideration the number of amount of delays or modifications.

On time delivery and with the fewest change orders, whatever makes it easier on the Govt COR

17 personnel without having to deal with San Antonio.

18 Bottom line is spend the money. and if they get what they asked for or near they are happy.

19

20 same as 32

34. In your experience do you have a preference for one of the contracting methods used? What do you view as the primary benefit(s) of that execution avenue?

Open-Ended Response

We pursue and execute both CPFF and FFP contract types, but strongly prefer CPFF contract forms. The CPFF form encourages greater participation in the clients mission, improved career development for staff and professional relationships, increased safety and quality, and reduced "unexpected event carnage" from security, site conditions and personality conflict conditions.

Where the requirements can be clearly defined up front FFP protects the government interest the best as risk is placed on the contractor. On CPFF contractors use the system by bidding low to win the project and then in this contingency environment use the system to build back their cost back up

Yes, from the Contractor perspective Cost Plus is preferred. The external risk factors do not need to have contingency applied to the bid price in order to get internal approvals to bid the work.

CPFF would be my suggestion as the only way to do work in a war zone.

CPFF provides a better quality product and greater consideration of client needs and input. FFP contract tend to drive out the better companies as the inherent risks are greater and there is no real reward (future opportunities) for exceptional services under the FFP model of contract awards.

I prefer CCPP. The more time you work on the project, the more money you earn.

Cost plus as so many outside influences can affect timescales and time is money

I believe the government is best served with a CPFF approach. That gives the government the most control and does not require a contractor to add large contingencies. Under FFP contracting unused contingency accrues to the contractor. Under CPFF unused contingencies accrue to the government. The owner (government) almost always benefits from more control and the ability to manage contingency rather than have contractors manage contingency.

For this AOR CPFF, provides the government with the greatest flexibility for changes, due to changing end user requirements and minimal costs for the changes. It also will have a greater chance of having a successful teaming arrangement between the COR, QA and the contractor. Since all will have a common goal to succeed. The government has the greater risk. Most contractors will bid extremely low under CPFF and bet on change orders because the Government will not T for a contractor because of the tight timeframes.

cpff allows more flexibility, higher degree of compliance with desired end use, higher quality, safer work site

Generally speaking, as an experienced Project Manager I personally prefer FFP contracts because they allow the opportunity to decrease cost thus increasing profit margin which results in reconition and advancement for those able to succeed on FFP. However, in a war zone the preference is CPFF because there are too many factors outside of the contractor's control.

CPFF is by far the best contracting method for contingent environments.

Cost Plus needed to be used for projects outside the wire, and the Security costs need to be T&M, not FFP elements

CPFF allows the flexibility to change on the ru to existing conditions or unexpected conditions and still meet the mission. FFP is to rigid for this environment and creates a adversarial relationship between the govt and contractor

CPFF fits the operating environment better due to the number of unknowns in a post conflict situation.

35. Which contract method have you had greater success with? Why do you think that is?

Open-Ended Response

We have had much greater success with CPFF forms and believe they provide greater success for the customer; particularly when the customer provides sufficient trained and qualified oversight to provide timely and appropriate technical direction to deal with endemic challenges of changing security, supply and site conditions.

FFP, design build, if it is used properly and not altered during the construction process by requiring unnecessary reviews and submittals. The burden is placed on the contractor to provide a complaint finished product. That is where the focus needs to be, not on the process.

3

4

Cost Plus. With FFP, the project is a success if the cost of the identified risks is less than your contingency, but the likelihood of the risk and the cost impact if it happens are both outside of your control.

Only CPFF has been performed

CPFF has been the most successful because it looks at more than just low cost. It is more likely to provide a better quality of contractor and realistic pricing for the services and goods requested. Best value is rarely achieved in FFP contracts.

FFP...because it is faster and more challenging and pressure.

Cost plus - Government willingness to engage and complete a project at a controlled cost

We have had success with both, but the government has paid us less on a CPFF versus FFP.

CPFF has been more successful, because every project requirements have changed even when the scope maybe well defined. The end user will have changes between when the project was programmed and when it is awarded or the end user will rotate out. CPFF lends itself to adjust to these scenarios quicker by having a more ambiguous scope to allow it. By doing this the end user gets the facilities they need to adapt to the mission changes rather than facilities they don't need that were programmed many months ago.

if success is defined as profit, then ffp if success is defined as better end product, then cpff

13

14

I have had equal success with both and a few failures with both

We have been very successful with CPFF by meeting the contractual FPOPs and returning funding that was not required.

We've had success with both types. No difference

CPFF as stated above

19

CPFF contractors can achieve better quality and work deliberately without the fear of loss due to conditions beyond their control

36. From the contractor perspective, which contract type would you prefer to work on?

Response	Comment
1 Cost Plus	
2 Cost Plus	risk is on government, higher margins are possible
3	
4 Cost Plus	
5 Cost Plus	
6 Cost Plus	
7 Cost Plus	
8 Cost Plus	
9 Cost Plus	
10 Cost Plus	Naturally there is less risk, but we tend to make more on FFP. Cost Plus in this environment when awarded based on realistic expectations will deliver a quality product and can adjust to the needs of the end user with minimal cost impacts if done in a timely fashion.
11 Cost Plus	
12 Cost Plus	
13 FFP	
14 Cost Plus	
15 Cost Plus	In a war zone I would prefer to work on CPFF. Outside of a war zone I would prefer FFP
16 Cost Plus	
17 Neither	No difference
18 Cost Plus	
19 Cost Plus	
20 Cost Plus	

37. From the perspective of the government, which contract type saves the most money?

Response	Comment
	This answer depends on type of project. CPFF is clearly lower cost for emerging areas, less defined scopes and conditions, and evolving mission requirements. FFP is lower cost for clean supply and deliver contracts with well defined scopes and conditions. Emerging scopes and conditions is typical of construction in contingency environments, whereas predictable scope and conditions is more typical in contingency material delivery.
1 Neither	The AFCEE Iraq program which was Cost Plus has cost overruns in the 100's of millions
2 FFP	
3	
4 Cost Plus	
5 Cost Plus	
6 Cost Plus	
7 Cost Plus	No always in the initial but certainly in the long term costs.
8 FFP	
9 Cost Plus	On FFP costs can run high with change orders that the client has not been able to foresee the Cost Plus is more of a partnership arrangement
10 Cost Plus	
	Because changes occur on every project, Cost Plus allows the government to make changes without being impacted as much by change orders under FFP or if scope is deleted. But it has to be managed with decisions being made quickly rather than paying for a contractor to sit on site while decisions are being made. Conversely under FFP, the contractor will move forward until the Government issues a stop work and it could cost more for the stoppage and to pay for work in place that may no longer be needed.
11 Cost Plus	
12 FFP	
13 FFP	
14 Cost Plus	
15 Cost Plus	This would of course be contingent on the Government selecting good contractors
16 Cost Plus	For our projects, CPFF is very cost effective for the government.
17 FFP	
18 FFP	they think it does but in the long term it costs more in claims and rework
19 Cost Plus	
20 Cost Plus	

38. From the perspective of the government, which contract type delivers projects faster?

Response	Comment
	This answer depends on type of project. CPFF is clearly faster for emerging areas, less defined scopes and conditions, and evolving mission requirements. FFP is faster for clean supply and deliver contracts with well defined scopes and conditions.
1 Cost Plus	
2 FFP	There is no incentive on Cost plus to deliver faster FFP has LDs
3	
4 FFP	
5 FFP	
6 Cost Plus	
	To complete a project of acceptable quality takes a set amount of time. The duration of time it takes to complete a project can only be reduced by increasing the cost or accepting and lower quality.
7 Neither	
8 FFP	
9 Cost Plus	Overall Cost plus
10 Cost Plus	
	Due to the LDs and to improve project margins, the motivation for the contractor is to get done as quickly as possibly to minimize general condition costs and to avoid LDs.
11 FFP	
12 Neither	
13 FFP	
14 Cost Plus	
15 Neither	
16 Neither	I don't believe that either has a greater impact than another.
17 FFP	
18 Neither	
19 Cost Plus	
20 Cost Plus	

39. From the perspective of the government, which contract type delivers projects with the best quality?

Response	Comment
1 Neither	
2 Cost Plus	Because government assumes risk and pays for quality shortfalls
3	
4 Cost Plus	
5 Neither	
6 Cost Plus	
	FFP contract drive away the quality qualified contractors and encourages the lesser experienced ones to aggressively persue work base soley on the lowest cost.
7 Cost Plus	
8 Cost Plus	
9 Cost Plus	Both parties are sticking with it to complete quality project
10 Cost Plus	
11 Cost Plus	FFP has a tendency to provide the bare minimum to maximize the projects
12 Cost Plus	
13 Neither	Both about the same in Afghanistan
14 Cost Plus	
15 Cost Plus	
16 Cost Plus	
17 Neither	
18 Neither	
19 Cost Plus	
20 Cost Plus	



Table 25 - Demographics Data

Demographics Questions								
Question	Mean	Standard Deviation						
What is your age?	51	8.96						
How many years have you been in the construction industry?	23.45	8.53						
How many years have you done construction in Iraq and/or Afghanistan?	5.17	1.72						
What is the highest level of school you have completed or the highest degree you have received?	Some College	Bachelor Degree	Graduate Degree					
	1	12	7					
	Contract Officer or Representative	Program Manager	Construction or Project Manager	Quality Assurance or Quality Control	Site Superintendent	Project Engineer	End User or Project Leadership	Other (Specify)
What best describes your current occupational position?	1	10	6	1	-	-	-	2 (Senior Executive)
What other positions have you held in Iraq or Afghanistan? (Select all that apply)	1	9	9	3	1	3	1	1 (Country Manager) 1 (Government COR)

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<b>14. ABSTRACT</b> <p>Firm Fixed Price and Cost Plus Fixed Fee contract types have been utilized the most for construction in the Iraq and Afghanistan theaters. Often construction occurs in contested regions that are known to be particular challenging, unpredictable, and unstable. The object of this study was to analyze the performance of these two contract types in this contingency environment, and to determine what internal and external influencing factors seemed to impact contract success the most.</p> <p>The methodology first evaluated existing construction performance data using bivariate and analysis of variance to identify differences in contract type. Next, a quantitative/qualitative questionnaire was conducted to gather expert opinions on the factors that were perceived to have the measures impacted success of each contract type the most, and what measures may be beneficial for evaluating contingency construction contract success in the future.</p> <p>The findings of this study indicated there was no proven advantage in cost performance for either contract type. FFP projects showed to control schedule growth significantly better than CPFF. CPFF contracts indicated a better quality product. Additional results of this study identified that understanding project performance in a contingency environment involved a balance of numerous variables that may impact projects in unique ways based on the chosen contract type.</p>					
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